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CHICAGO, APRIL, 1914.

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THE BELL-INDEPENDENT CONTRACT.

CULMINATING the three months' discussion which followed the famous letter of December 19, 1913, from N. C. Kingsbury of the American Telephone and Telegraph Company to Attorney-General McReynolds, comes the proposed Bell-Independent connection contract which we print on another page. This form now carries the endorsement of the directors of the National Independent Telephone Association, and so must appeal to the gentlemen who comprise that board as a benefit to the independent cause.

These directors, however, very considerately refrained from committing their member companies to the agreement. Perhaps it is as well that their endorsement was tentative merely; for there is likely to be a difference of opinion, among the independent operators who actually have the power to sign and to endorse, as to the advisability of doing so.

Those who are interested in seeing the controversy settled as it now stands have intimated that the draft contract, as it was submitted to the National Association directors March 16, already had the approval of the United States attorney-general. This in spite of the fact that Mr. Kingsbury himself clearly stated that the contract *had not even been read* by the attorney-general at the time it was submitted.

The first draft of any contract is usually one-sided—and certainly this one is no exception to the rule. That is ordinary business practice, and no particular reflection on the Bell company. No business man would expect to close any deal of magnitude without considerable give-and-take sparring in the matter of contracts. Indeed, the Bell officials must have been somewhat astonished when the independent directors so placidly accepted the first one offered.

It is not likely that many independent companies will sign the contract as it stands. Those who do so must indeed be eager for Bell connections. For he who cannot perceive in it a heavy burden on the independents must be an optimist of the first water. Practically all of the obligations are imposed upon the independents; very few upon the Bell. The famous ten-cent switching charge goes always to the Bell company, whether the message originates at a Bell or an independent station. The tolls themselves go all to the Bell. The independent company is expected to make the connection, carry it to the Bell switchboard, maintain the connection, supply the extra labor necessitated by the desire of its patrons to use such connections, to bill the toll business resulting from such connections, and to carry the responsibility for delinquent bills.

According to Section 6, Article III, the Bell company

"shall not in any event be liable to the subscribing company for any accidents, losses or costs incurred at, on or in connection with the plant of the subscribing company in any exchange connected . . . with a connecting exchange of the Bell company, or for the quality of the service, or for the failure of any conversation for any cause whatsoever, resulting from such connection and not due to the negligence of the Bell company, and, whenever in any case such a plant of the subscribing company is not maintained in a condition to afford efficient services over the trunk lines . . . the Bell company may discontinue the service until the defective condition is remedied." Any differences arising on this score are to be referred to arbitration. But there is no mention of the independent company's freedom from liability for defects of the Bell service or system.

If the subscribing company fails to pay any sum due within 15 days after it becomes due and after demand has been made, or (Section 8, Article III) "shall violate any of the other provisions of this agreement and such violation shall continue for 30 days after written notice thereof from the Bell company, the Bell company may, at its option, thereupon by written notice terminate this agreement; provided, however, that, in case the subscribing company shall, except as herein provided, connect the toll lines of the Bell company with the exchange or toll lines of any individual, firm or corpration other than an exchange of the subscribing company . . . the Bell company shall have the right thereupon to terminate this agreement without notice." But there is no provision that the independent subscribing company may similarly terminate the agreement upon any violation by the Bell company. The Bell company may connect the lines of the independent company with whomsoever it pleases; and it need make no provision for delinquency in payments due to the independent subscribing company, because under the contract there is never by any possibility any money due to the independent company from the Bell company.

Under Section 1, Article II, the subscribing company will "supply and maintain all trunk lines connecting the switchboard of a connecting exchange with the switchboard of a connecting exchange of the Bell company," all such trunk lines to be "so equipped and arranged as to be *appropriate* to the system by which, in each case, is operated the Bell company's connecting exchange." The word *appropriate* here may be construed as you please. Possibly it means "Bell standard" equipment.

Article III, Section 3 provides that "no interchange of telephonic communications shall be required or permitted hereunder in either direction between the subscribers of the subscribing [independent] company in any exchange connected, as herein provided, with a connecting exchange of the Bell company and the subscribers in any other exchange reached by the lines of the Bell company and located *within a radius of 50 miles* from such exchange of the subscribing company." Agreement to this provision effectually prevents the physical connection of local systems, in the 1234 communities served competitively by Bell and independent companies as shown by the table on page 172.

In considering this contract, we have taken the position that the two parties are equal in their rights and privileges; that interconnection, if it gave the independents access to Bell lines, also gave the Bell access to independent lines; and that if the Bell stations outnumber the independent, that merely means more connection fees from independent to Bell than from Bell to independent.

Judging by its contract the Bell company does not so consider the matter. It assumes that it has something the independents want, and for which they can be made to pay. It does not admit that the independents have anything it wants. This point was emphasized by Mr. Kingsbury when he said at the meeting March 16, "It is not a matter that the Bell company is urging other companies to accept."

Regardless of whether the Bell company wants this or any other contract, it has promised the attorney general to make an equitable arrangement with the independents, and the attorney-general accepted the offer at its face value. The negotiations, now begun, will have to be completed; and completed to the reasonable satisfaction of the independents.

We have no comment to offer on the action of the National Association directors in endorsing the contract as submitted. But the directors of the Independent Telephone Association of America have not endorsed it yet. They will consider it April 11, and we cannot believe they will be able to give it their approval. We shall, indeed, be disappointed if they do not take steps to prepare and submit to the Bell company an amended form of contract.

It is said that the Bell company usually insists upon acceptance of the contracts it prepares itself. That is perfectly good business if, in the language of the hour, it can "get away with it"; indeed, we are not accusing the Bell company of bad faith or any other commercial misdemeanor in this matter. As we said before, haggling over contract terms is the rule rather than the exception in any business. So if the telephone business follows the general rule, the independents will submit their version of a contract, and the Bell company will come back with another still further modified, and the independents will try it again, and so on until maybe five or six drafts have been rejected before the satisfactory form is decided upon.

This is obviously the function of an independent association. It would be quite impossible for each independent company to carry on such negotiations for itself. Inasmuch as the old association has fallen at the first broadside, it is up to the new organization to carry on the work. Let us hope it will take advantage of its opportunity.

Meanwhile, we cannot advise any independent company to sign the present contract form.

THE GOVERNMENT'S PRESENT OPERATIONS.

IN THE ordinary sequence, our article this month on government ownership should be number two of the series started last month. Number two has, however, been postponed, and for a very good reason: We found opportunity to substitute something better. The paper by T. P. Sylvan, who is one of the keenest observers and analysts in the Bell organization, is entitled "Government Versus Private Ownership"; but it is really an analysis of some of the present operations of the government.

It is the postoffice department of our government that wants to take over and operate our telephones. It is the postoffice department that has tried so hard and long to avoid an annual deficit, and has never yet succeeded. Yet it is of record that one business man, whose ability to operate large interests successfully had already made him several million dollars, offered to take over the government postal system, establish one cent letter postage, make quicker deliveries and pay a dividend

on the necessary investment. No other business man who has given any study to the present operation of the system doubts that it could be done.

Mr. Sylvan divides his subject into three parts: The ability of the government to operate a telephone system, the ability of private companies to operate telephone systems, and the effect which government ownership would have on the affairs of the country. The first is most important; for it must be clear to everyone familiar with public utility operation, after reading Mr. Sylvan if not before, that the government could not possibly operate our present telephone system successfully.

The second division of his paper needs litle comment. The private companies who are operating telephones in this country have proven their ability and efficiency in an extraordinary manner. The telephone history of the United States has shown an activity unparalleled in any other part of the world. Today America's telephone service is the standard of all civilized countries. Indeed, there are few things in which we are so far ahead of the rest of the world as in our telephone service. And these things are so obvious that the inability of the government ownership advocates to see them is almost incomprehensible.

As to the effect of government ownership on the affairs of this country, we fear even Mr. Sylvan's remarkable treatise does not convey an adequate conception of the literal chaos into which our business, to say nothing of our society, would descend under the influence of such telephone service as the respective governments render their subscribers in England, Germany or France.

We are not a patient people. Even now we protest vehemently if the operator keeps us waiting ten seconds. We demand instant, 100 per cent service, and connection with everybody. The man who has no telephone in his home is hardly, in our estimation, worth considering for any serious purpose; while no business house or store, however small, could even exist without at least one telephone. Contrast that condition with that of the largest European countries, including England. There not only private houses, but large business houses and even (imagine it) hotels get along comfortably without any telephone connection whatever! That is the sort of development that is fostered by government operation.

The lay citizen who takes enough interest in affairs to read the arguments against government ownership presented through this telephone trade paper, or by operating telephone companies, may be tempted to regard such arguments as biased by business interest, just as he realizes the arguments of the opposition to be biased by political interest. It should be pointed out carefully to him that the operating company, which this paper represents, could not possibly be a loser through government ownership. Every operating telephone company is a joint stock company, restrained by regulatory laws from earning more than a reasonable amount of interest on its investment. In taking over such a company the government would be under obligations to reimburse the stockholders, releasing their money for other investments just as profitable. *That lay citizen himself is the one who will suffer.*

Arguments *against* government ownership of wire systems are, and must be, prompted by motives of public welfare. Arguments *for* government ownership of wire systems may be, and often are, advanced in the same spirit through a sort of zealous ignorance; but we feel impelled to repeat our former statement that anyone who advances such arguments after making a conscientious and thorough study of conditions must be actuated by an entirely different spirit.

CANADIAN STATISTICS FOR 1913

Telephone statistics for the Dominion of Canada for the year ending June 30, 1913, have been published by the Department of Railways and Canals and show a marked increase in the use of telephones within the last twelve months, according to the Canadian *Electrical News*. The report states that as far as these figures are complete there is one telephone now in use in Canada for every 16.2 persons and it is thought that if absolutely complete figures had been received this number would be lowered to possibly 15. The total number of organizations which made statistical returns to the department was 1,075. The report states that there are over 100 organizations known to the government from which replies were not received and that there are probably a considerable number of smaller organizations of which the government has no direct knowledge. It is evident, therefore, that the total number of telephone companies at present operating in Canada would be 1,200 or possibly 1,300 altogether.

The character of the various telephone organizations varies considerably in the different provinces. In Alberta the telephones are operated by the provincial government as one comprehensive system. In Manitoba this is practically the case, but there are a number of telephone companies still operating. Saskatchewan, while having its government system, has also a very large number of small stock companies. In Ontario and Quebec the situation is pretty well controlled by the Bell Telephone Company, especially in Quebec. In Ontario the number of stock companies and co-operative companies has increased rapidly so that Ontario's total of telephone organizations is greater than in any other province of the Dominion. In British Columbia the situation is pretty well controlled by one large company, as is also the case in the Maritime provinces. The table herewith explains the distribution in the various provinces very fully:

Province—	Gov't	Munic.	Stock	Co-op.	Part'ship	Priv.	Total
Nova Scotia.....	..	..	21	28	17	17	83
New Brunswick...	..	..	12	3	1	9	25
P. E. Island.....	..	..	1	..	..	..	1
Quebec	..	..	44	26	3	28	101
Ontario	1	38	143	148	41	80	451
Manitoba	1	7	4	14	1	7	35
Saskatchewan	1	5	304	42	..	9	361
Alberta	1	1	1	..	..	..	3
British Columbia...	..	1	12	1	..	1	15
Total	4	52	543	262	63	151	1,075

The report shows that there are now 1,092,587 miles of wire in use with 463,671 telephones. The gross earnings in 1913 were $32.13 per telephone, and operating expenses $24.10 per telephone. Capitalization works out to $129.13 per telephone. Of the total number of telephones in use 269,843 are central energy type and 193,828 are magneto type. The report contains the names of and a quantity of interesting information regarding every telephone organization in Canada.

A new cable is to be laid jointly by the British and Dutch governments during this year, and will be the longest cable of its kind in the world, covering a stretch of 79 nautical miles between Aldeburgh and Walcheren. It will be of the four-core coil-loaded type.

A White Cedar Pole After Thirteen Years. Note the Erosions.

Creosoted Pine Pole After Thirteen Years. No Erosion.

Courtesy of the Gulf Coast Lumberman.

Pole Broken by Wind on the Bennington, Vt., Line.
Courtesy New England Telephone Topics.

Some of the Havoc at Princeton, N. J., January 31. New York Telephone Company.

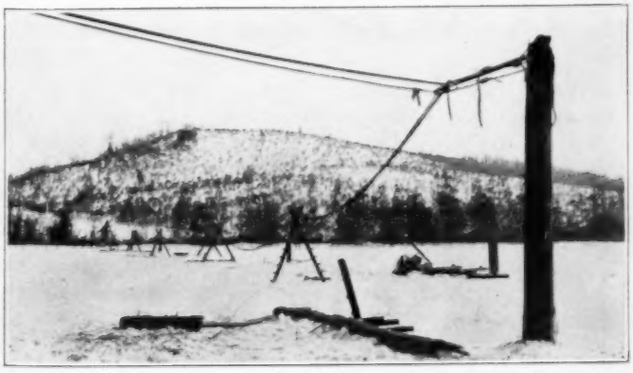
Two Views of the New York-Chicago Line Along Springfield Avenue, Irvington, N. J., After the March Storm.
Courtesy New York Telephone Company.

Pole Broken by Wind on the Bennington, Vt., Line.
Courtesy New England Telephone Topics.

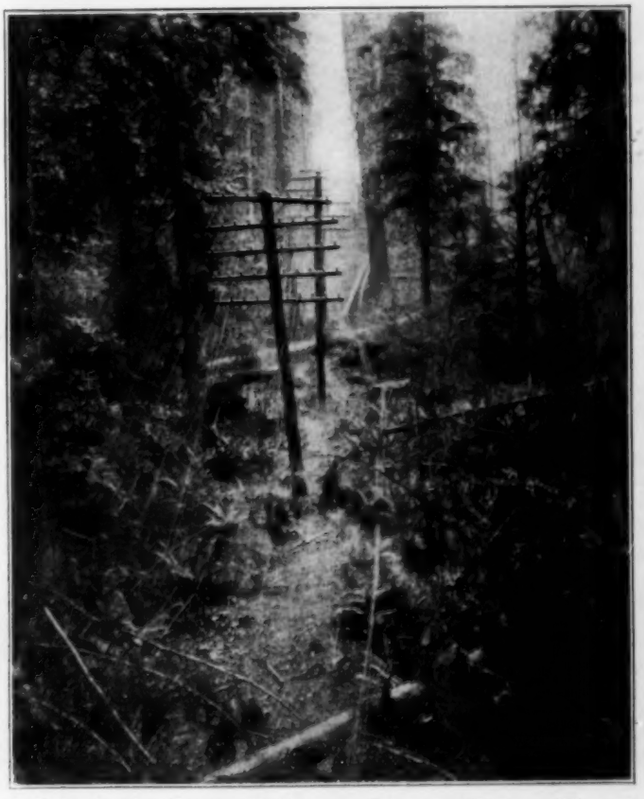
STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

The Exchange Building at Kingston, Jamaica, West Indies. Note the Cable Construction.—Courtesy Mountain States Monitor.

Western Union Pole Line Near South Orange, N. J. Aerial Cable of New York Telephone Company Still Working and Supporting Pole.



The Morristown-Dover Trunk Line Near Dover, N. J., After the March Storm.
Courtesy New York Telephone Company.



A Toll Line in Western Washington. Emergency Duplex. Wire on Ground at Right Used Pending Restoration After Storm.
Courtesy Pacific Telephone & Telegraph Company.

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

Iowa's Convention

The eighteenth annual convention of the Iowa Independent Telephone Association was opened at the Chamberlain hotel, Des Moines, at 2:00 p. m., March 17, with a registration of over 200 managers and operators.

The first session of the convention was opened with an address by H. L. Beyer, of Grinnell, president of the association during the last year.

Mr. Beyer's address ran along practical lines. He devoted much time to discussing economical handling of traffic and the increasing of efficiency of service on the part of operators. "The thing that we ought to be most interested in at this time," he said, "is the increasing of efficiency among the operators of the Independent lines of Iowa and the handling of traffic in the most practical and economical manner.

"Our watchword," said Mr. Beyer, "should be service. We should make that word our slogan."

The president also stated that he was in favor of having a traveling expert operator in the field to aid in instructing operators in handling traffic. He also touched on the Interstate Commerce Commission's regulation of telephone companies and said that every independent telphone company in the United States was under the Interstate Commerce Commission regulations.

A feature of the Convention was the operators' school, conducted by W. S. Vivian of the Independent Telephone Association of America, who addressed nearly fifty chief operators.

Mr. Vivian talked upon general topics connected with handling of telephone traffic and said that what the telephone companies of the country were selling was service. "And," he said, "whether they give good service or bad, depends very largely upon the operators in charge of the desks."

A large number of exhibitors had displays at the convention, showing all the modern telephone equipment with attendants to explain their workings to the delegates and visitors.

Indiana Commission Orders Connection

In one of its first cases providing for physical connections between telephone properties, the Indiana Public Service Commission made an order finding that "public convenience and necessity" demanded an exchange of service, both local and long distance, between the Citizens' Telephone Company of Clay City and the Harrison Township Telephone Company of Clay County and the Farmers' Mutual Telephone Company of Clay County.

The commission also found that to compel an exchange of service between the Citizens' Telephone Company and the Clay City Mutual Telephone Company would result in irreparable injury to the Citizens' Telephone Company and would be a detriment to the service. The commission also refused permission to the Lewis Telephone Company, at Lewis, to restore long-distance service to the Harrison Township, Farmers' Mutual and the Clay City Mutual Companies.

To provide long-distance and local service to the Harrison Township and Farmers' Mutual Companies, the Citizens' Company is to construct a cable line connecting the switchboards within thirty days.

A free interchange of local service is to be provided and long-distance service is to be exchanged upon a just and equitable basis, according to the commission's order. By the order the Clay City Mutual Company, with about fifty subscribers, will be left without toll service. The commission's decision in dealing with the case was based on Section 8 of the public utility act.

Nebraska's Convention

The convention of independent telephone companies of Nebraska met in Columbus, March 11, 12 and 13. About seventy-five men gathered to discuss topics of interest to the companies and the users of independent telephones. On Thursday morning the real work of the convention started at Orpheus hall, where the problems of the industry were threshed out by successful telephone men. Thursday afternoon President C. J. Garlow gave a well prepared address which was highly appreciated by the visiting delegates. Mr. Garlow has been president of the telephone organization for five years past and complimentary to him the association made Columbus the place for this year's meeting. His address was of unusual interest because his experience in building up one of the largest independent telephones in the state and being its president so long gives him unusual prestige. In the evening a sumptuous banquet was served by the Y. M. C. A. The tables were tastefully arranged in a quadrangle and the menu furnished was of the best.

Friday was business day and the election of officers took place. The election resulted in the re-election of Mr. Garlow as president for the sixth time consecutively. Warren Pratt, of Kearney, was elected vice-president; L. E. Hurtz, of Lincoln, secretary and treasurer. The place for the 1915 meeting has not been selected but it is quite likely that it will be held in Omaha.

Postal to Operate Telephones

The North American Telegraph Company and its associate, the Postal, will enter the telephone field in competition with the Bell people, and with a rate schedule materially lower, it was announced by Vice-President A. S. Harris. The office of D. G. McIntosh, Minneapolis, is connected with the main office in Chicago for public service; therefore extensive long-distance connections will be made throughout the Northwest. The opening of a Denver-Salt Lake connection is planned.

Eventually all the lines will be linked and an invasion of the field of city service will be undertaken. The route selected for the Chicago connection is along the company's telegraph line on the Soo Railroad.

New York Fight Affects Commission

New York's fight for lower telephone rates is believed to have received a setback when the friction on the subject in the state administration was exposed to the public. Martin S. Decker resigned the chairmanship of the Second District Public Service Commission, that is handling the matter, and Governor Glynn at once appointed Seymour Van Santvoord as chairman. Mr. Decker will continue as a member of the commission.

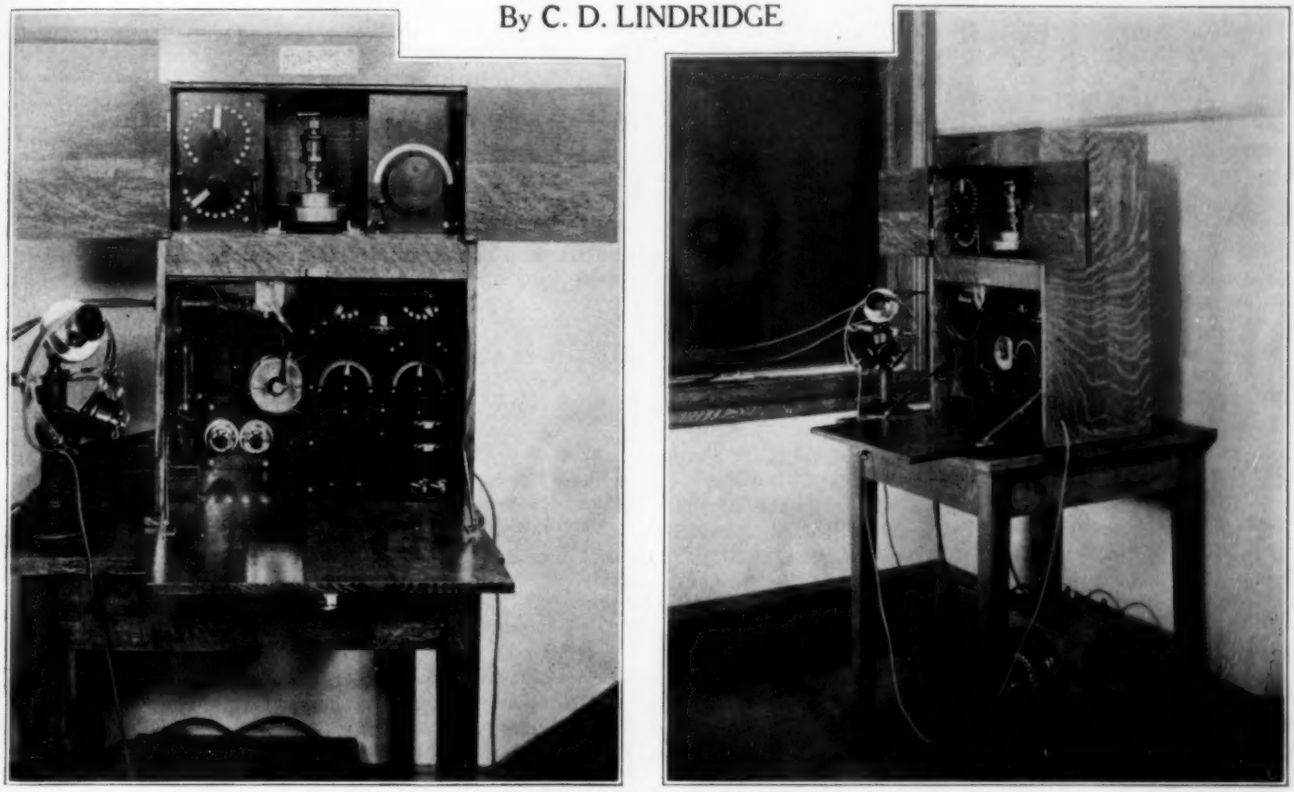
This action was taken after the commission had voted down the proposal to have the New York Telephone Company spend $200,000 of its own money to appraise its property as a basis for readjusting rates.

The assembly at Albany, N. Y., 17 to 16, passed the Goldberg bill reducing to five cents the price of five minute telephone calls in Greater New York.

High Frequency Telephone Transmission

Multiplex or Duplex Telephony as a Relief for Traffic Congestion

By C. D. LINDRIDGE



Complete Sending and Receiving Apparatus for High Frequency Transmission.

MULTIPLEX telephony was given considerable attention in 1911 when Major Squier presented his paper on the subject before the American Institute of Electrical Engineers. It was generally admitted at that time that wireless methods might be applied to wire telephony to good advantage in certain cases where one or more additional talking circuits are urgently needed and where it is impracticable to obtain additional wires. The adoption of multiplex telephony on a somewhat extensive scale was proposed by Major Squier and while the possibilities of high frequency transmission were generally recognized, some very strong arguments were advanced against an extensive application of multiplexing in the immediate future. In commercial telephony, however, where the investment in toll lines approaches one-half billion dollars, the use of high frequency transmission to even a very limited extent may result in a saving of considerable importance, although it may be small compared with the investment in toll line construction.

The greatest difficulties which have been anticipated in applying a high frequency multiplex telephone system are, first, in obtaining sufficient energy at the receiving station for telephone transmission purposes where the currents are transmitted over a line of any considerable length; second, in preventing serious cross-talk between two or more high frequency current trains of neighboring frequencies and between currents of the same frequency in the same pole-line or cable route; and third, in transmitting the high frequency currents over loaded circuits. The first difficulty, that of loss of energy, must be considered in every case of duplex and multiplex telephony; although, as the lowest frequency only need be used in duplex telephony and as the transmission losses are much greater with the higher frequencies which must necessarily be used in multiplex telephony, the difficulty due to loss of energy is much less with duplex telephony than it is with multiplex telephony. The second and third difficulties, those of cross-talk and transmission over loaded circuits, need not be considered where it is desired to duplex only one non-loaded circuit in a pole-line or cable route.

It may be expected that in most cases at least two or three high frequency current trains of different frequencies can be transmitted along different wires in one wire route without undue cross-talk. On this supposition duplex telephony by means of high frequency currents may be used for what may be termed "temporary busy hour service." A case may be taken for example where a group of ten or fifteen open wire toll lines between points thirty or forty miles apart become inadequate for the service and additional facilities have to be provided. Rather than add open wire lines it is found that greater economy may be effected by replacing the open wires by aerial cable. The annual charges on the aerial cable may amount to approximately $5,000. The open wire lines which are to be pulled down immediately the cable is in place may be in a serviceable con-

dition and the cost of maintaining them may not be excessive. In such a case running the aerial cable twelve months before it is required represents a loss of perhaps $4,500, allowing for the difference in the cost of maintenance of the aerial wire and cable. To view the subject from another standpoint, by deferring the purchase of the cable twelve months a saving of about $4,500 may be effected in one circuit group. To effect this saving two or three of the circuits may be duplexed for a short period and when the cable is finally in place the duplex apparatus may be removed for use elsewhere. In this manner the outlay of a somewhat considerable amount of money may be deferred by providing duplex service for perhaps less than ten per cent of the maximum number of simultaneous connections in the circuit group.

The demands as regards reliability of operation for this temporary service are less severe than if the duplex apparatus should be required to provide 50 per cent of the maximum number of simultaneous connections in the circuit group. In such a case a temporary failure of the duplex apparatus might have serious effects on the service. Furthermore, not only need the duplex apparatus be available for only a short period—perhaps twelve months—but the apparatus may be actually in service only a very small part of the twelve months, as it need be in operation only during the busy hour of each busy day during the busy season. The charges on the high-frequency apparatus, including the cost of maintaining it should not exceed four or five hundred dollars a year. A net saving of $4,000 or more may, therefore, be effected in one circuit group in one year by using high-frequency apparatus and having it in operation a total of perhaps less than one hundred hours.

In the same manner the purchase of a second cable may be deferred when the service increases to such an extent that it cannot be cared for by the physical and phantom circuits of the cable first placed in service. This is assuming that the capacity and inductance of the cable first placed in service are not too great for high frequency transmission.

In toll telephone service it is the practice to use the phantoms, which provide better transmission than the physical side circuits, in preference to the physical side circuits for long haul connections. Where the circuits are to be duplexed the duplex transmission efficiency may in many cases be considerably lower than the transmission efficiency of the side circuits, due largely to the distortions produced in converting the comparatively low frequency currents in the subscriber's loop to high frequency currents in the toll line circuit and in converting them back to low frequency currents at the distant end of the line. This, however, does not necessarily prevent the high frequency apparatus being used to defer the new construction, as it can be used exclusively for very short-haul service. The long-haul service may be handled over the phantom circuits, the side circuits may be reserved in the busy hour for short-haul service, and the very short-haul service, which would otherwise cause an overload on the side circuits in the busy hour, may be transferred in the busy hour to the high frequency apparatus.

In cases where the duplex transmission is found to be too poor for conversations between subscribers, it may be used to good advantage in certain cases for order circuit service between operators, thereby making available for the use of the subscribers the physical and phantom circuit time which is at present used for the passing of orders and reports from one operator to another. With the provision of an additional talking path between distant toll operators, it would seem that a considerable saving might be effected by modifying the method of handling the service over the toll lines to have the maximum amount of physical and phantom circuit time available for subscribers' conversations.

The most likely field of immediate usefulness for high frequency transmission of telephone currents may be, perhaps, in this temporary busy-hour service. It is possible, however, that high frequency currents may also be used to good advantage in very long-haul service. While the tranmission of high frequency currents over very long distances presents great difficulties, the high frequency apparatus and currents may perhaps with advantage, and without great difficulty, be localized at a repeater or amplifier station and used merely to provide two-way transmission for the amplifiers. High frequency transmission appears to offer attractive possibilities for this service, particularly in connection with the ionized gas type of amplifier, which is expected shortly to come into commercial use.

Cost Per Dollar, $0.00014

It is a remarkable advertisement that the New England Telephone and Telegraph Company has just issued concerning sales by telephone, says the *Transmitter*.

"Sales, $250,000; tolls, $36," is the heading it carries. The text tells how one George R. Kelly, head of a Boston sales agency for the American Window Glass Company, accomplished this feat. Mr. Kelly's firm, it seems, anticipated a rise in the price of window glass and wanted to give its customers the benefit of current quotations.

There was no time to make personal visits. Letters were considered unsatisfactory. So the head of the agency began making the business calls by telephone. In ten days he made toll calls to widely separated points in New England, booked orders aggregating $250,000, and his total expense was $36.

Steel for Permanent Magnets

Steel containing 5½ per cent tungsten makes excellent permanent magnets. The steel should be heated above the recalescence point, and when quenched should show a fine-grained fracture. After magnetizing a magnet should be "aged" by prolonged heating in boiling water or steam. A short bar magnet tends to lose its magnetism quickly; the coefficient of demagnetization for a bar magnet twenty-five diameters in length is 0.05, while that of a magnet five diameters long is 0.5, or ten times as great. A bar magnet five hundred diameters long is supposed to be permanent. The magnetic force of the best magnets is considered by Prof. S. P. Thompson to be only 60 to 80 per cent of what may be eventually attained.

Prof. Korn writes that he has attempted to transmit kinematographic films by telegraphy and has required one hour to transmit a series of 20 films. The usual rate of transmitting a picture of the ordinary size is about ¾ hour, and if four times as many films are to be transmitted in that time we cannot require as many details. For the experiments, films showing the gesture of an actor were used and transmitted with great success. This seems to open up a new field for the newspapers, for it would be possible to transmit a series of pictures within a short time, although the expense would be considerable.

The Bell-Independent Connection Contract

Draft Agreement Drawn by Bell Officials, Endorsed By Independent Association

AT THE Congress Hotel, Chicago, March 16, the board of directors of the National Independent Telephone Association held its regular meeting. This particular gathering, however, was made epochal by the presence of American Telephone and Telegraph Company representatives with a draft contract for the furnishing of "qualified toll line service" to independent telephone companies.

The association had previously appointed a committee to go over the tentative form of contract with N. C. Kingsbury of the Bell Company and his associates at New York. The committee, consisting of Manford Savage, Champaign, Ill.; C. E. Tarte, Grand Rapids, Mich.; C. Y. McVey, Cleveland, Ohio; F. L. Beam, Mt. Vernon, Ohio, and F. B. MacKinnon, Washington, D. C., spent three days in this work. An understanding of the form of agreement having been reached, the Bell representatives were invited to meet the association's directors in Chicago, which they did the morning of March 16.

RESOLUTION OF THE BOARD OF DIRECTORS OF THE NATIONAL INDEPENDENT TELEPHONE ASSOCIATION, MARCH 16, 1914.

Whereas, the directors of the National Independent Telephone Association have carefully read the proposed contract under which the Bell companies will furnish the Independent companies of the United States connection for toll service and also the letter of Mr. Kingsbury to the Attorney General of the United States, of the date of December 19, 1913, and find that in our best judgment the contract clearly and fairly in its details carries into effect the spirit of that letter,

And Whereas, the agreement applies generally to competing companies, it being our understanding that all companies not competing with the Bell company may connect up for all toll business on the usual terms as to commissions, etc.,

And Whereas, the acceptance or rejection of the agreement is left to each individual Independent company,

And Whereas, this association has no authority to enter into any contract that will bind its members therefor,

Be It Resolved, that this association commend the agreement as being fair, leaving the question as to whether it should be entered into by Independents to each individual company to be determined solely by the advantage or disadvantage that such company will receive from the connection.

The deliberations were adjourned at one o'clock for luncheon, the following being present:

N. G. Hunter, association; N. C. Kingsbury, A. T. & T. Co.; W. C. Handlan, association; A. G. Beam, Garford Mfg. Co.; J. M. Plaister, association; Mayo Lenz, Runzel-Lenz Co.; H. D. Fargo, Telephony Publishing Co.; G. A. Briggs, Chicago Telephone Supply Co.; H. B. McMeal, association; Warren Pratt, association; L. D. Kellogg, Kellogg Switchboard and Supply Co.; F. H. Woods, association; C. Y. McVey, association; T. P. Sylvan, A. T. & T. Co.; F. B. MacKinnon, association; T. W. Allen, association; C. E. Tarte, association; Manford Savage, association; F. L. Beam, association; K. W. Waterson, A. T. & T. Co.; H. C. Todd, association; Ed. J. Mock, TELEPHONE ENGINEER; J. B. Earle, association; E. S. Pillsbury, A. T. & T. Co.; Ben Hyde, association.

The formal proposal of the American Telephone and Telegraph Company to the attorney-general of the United States, offered December 19, 1913, was published in the January number of TELEPHONE ENGINEER and the February number continued the discussion which it evoked. Demands were continually made by independent operating companies for the further elucidation of several involved points in the proposal. In the draft contract submitted to the directors of the independent association March 16, just three months after the original offer was made, these points are made clear. This is the form of the contract:

THIS AGREEMENT, made this ..... day of ....., 19.... by and between the ..... Telephone Company, a corporation of the State of ..... (hereinafter called the "Bell Company"), party of the first part, and the ..... Telephone Company, a corporation of the State of.....(hereinafter called the "Subscribing Company"), party of the second part:

Witnesseth: *Whereas*, the Bell Company now operates for itself, in connection with certain exchange and toll line systems operated by connecting companies in its territory, a telephone exchange and toll line system connecting with the toll line system of the American Telephone and Telegraph Company and the exchange and toll line systems of said American Telephone and Telegraph Company's other associated companies and their connecting companies in the respective territories of such associated companies, all of such systems together constituting the general exchange and toll line system commonly known as the "Bell System," and

Whereas, the Subscribing Company now maintains and operates for itself, in the same territory in which the Bell Company operates its exchange and toll line system, a public commercial telephone exchange or public commercial telephone exchanges, independent of and disassociated from the Bell System, and desires to secure for its subscribers in its exchange or exchanges certain toll line service to and from points on the Bell System, and to that end to connect its exchange or exchanges with the switchboard of an exchange or the switchboards of exchanges of the Bell Company, and the Bell Company is willing to permit such connection or connections under the terms and conditions of this agreement;

Now, Therefore, in consideration of the premises and of the premises and agreements hereinafter contained, the parties aforesaid do hereby agree as follows:

ARTICLE 1.

The Bell Company will, upon the receipt, from time to time during the continuance of this agreement, of a written application from the subscribing Company in the form hereto annexed marked "A" and properly filled out:

1. Permit the Subscribing Company to directly connect, as hereinafter provided, the switchboard of any public commercial telephone exchange then maintained and operated by the Subscribing Company in the territory in which the Bell Company operates, and specified in such application, with the switchboard designated by the Bell Company of an exchange of the Bell Company (hereinafter termed "a connecting exchange") nearest such exchange of the Subscribing Company and specified in such application, for the purpose of enabling the Subscribing Company through such interconnection to secure for its subscribers and other patrons in such exchange the qualified toll line service defined in Section 3 of Article III hereof, to and from points outside of such connecting exchange of the Bell Company and reached over its toll lines or the toll lines of the American Telephone and Telegraph Company and its associated companies and their connecting companies; provided, however, that the trunk lines connecting such exchange of the Subscribing Company with such connecting exchange of the Bell Company shall be supplied and maintained by the Subscribing Company from the switchboard of such exchange of the Subscribing Company either up to such a point on or near the premises of the Bell Company in such

connecting exchange or up to such other point nearer such exchange of the Subscribing Company, as the Bell Company may elect and in either case designate; the construction and maintenance of the requisite wiring to complete the connection of such trunk lines with the switchboard of such connecting exchange to be done by the Bell Company.

2. Furnish its facilities for the interchange of telephonic communications through such connecting exchange, and make the proper switchboard or other connections and promptly perform the necessary operating to permit of direct communication, as herein provided, between the subscribers and other patrons of the Subscribing Company in any exchange of the Subscribing Company, connected, as herein provided, with a connecting exchange of the Bell Company, and the subscribers and other patrons of the Bell Company, and of the other companies in the Bell System, and also the subscribers and other patrons in any exchange now or hereafter connected, under an agreement similar hereto, with a connecting exchange of the Bell Company or with a connecting exchange of any other company in the Bell System, subject to the limitations and charges specified in Sections 3 and 4 of Article III hereof.

3. Answer promptly at all times any inquiries with reference to the rate for any contemplated call to be originated, or the elapsed time or charges on any completed call originating, at any exchange of the Subscribing Company connected, as herein provided, with a connecting exchange of the Bell Company, and render monthly to the Subscribing Company a statement showing, in sufficient detail to enable the Subscribing Company to properly bill its subscribers, the amounts due for or on account of all tolls and other charges for communications interchanged hereunder and originating in each such exchange of the Subscribing Company during the monthly period covered by the statement.

ARTICLE II.

The Subscribing Company will:

1. Supply and maintain, in accordance with the provisions of Section 1 of Article I hereof and as hereinafter provided, all trunk lines connecting hereunder the switchboard of an exchange of the Subscribing Company with the switchboard of a connecting exchange of the Bell Company; the switchboard of each central office in any exchange of the subscribing Company, connected hereunder with a connecting exchange of the Bell Company and having two or more such offices serving the subscribers of the Subscribing Company in such exchange, to be directly connected by trunk lines with the switchboard of such connecting exchange, and all trunk lines so supplied and maintained hereunder by the Subscribing Company to be of the so-called metallic circuit type, and to be so equipped and arranged as to be appropriate to the system by which, in each case, is operated the Bell Company's connecting exchange with which such trunk lines are connected. It will, in every case, locate, construct, equip, maintain and operate such trunk lines so as not to endanger the plant of the Bell Company in the connecting exchange and so as to maintain at all times a proper quality of service thereover, and will, furthermore, constantly provide a sufficient number of trunk lines in each case reasonably to accommodate the telephone traffic thereover.

2. Make the proper switchboard connections and promptly perform the necessary operating to permit the Bell Company's operators to establish direct communication, as herein provided and subject to the provisions of Section 2 of Article III hereof, between the subscribers and other patrons in any exchange of the Subscribing Company, connected, as herein provided, with a connecting exchange of the Bell Company, and the subscribers and other patrons of the Bell Company and of the other companies in the Bell System, and also the subscribers and other patrons in any exchange then connected, under an agreement similar hereto, with a connecting exchange of the Bell Company or of any other company in the Bell System, subject to the limitations and charges specified in Sections 3 and 4 of Article III hereof. It will not, except as herein provided, connect the toll lines of the Bell Company with the exchange or toll line of any individual, firm or corporation other than an exchange of the Subscribing Company connected hereunder by its trunk lines with a connecting exchange of the Bell Company.

3. Adopt and observe, in the handling of interchanged telephonic communications, and require its subscribers to observe such rules and regulations as the Bell Company may from time to time make for the use of its lines.

4. Supply, without charge, at the request of the Bell Company, one copy of each issue of the Subscribing Company's telephone directory for each exchange of the Subscribing Company connected, as herein provided, with a connecting exchange of the Bell Company, and at its option furnish the Bell Company with the same information as to changes in or additions to the directory listings for each such exchange of the Subscribing Company as it furnishes from time to time to its information operator in each such exchange.

5. Pay monthly all tolls and other charges for communications interchanged hereunder and as herein provided, and originating in each exchange of the Subscribing Company connected, as herein provided, with a connecting exchange of the Bell Company, and, within fifteen (15) days after the receipt by the Subscribing Company of a statement of account of such tolls and other charges, remit to the Bell Company, at its office in an exchange designated by the Bell Company for that purpose and specified in the application made hereunder for such exchange of the Subscribing Company, all sums due to the Bell Company for or on account of all such communications transmitted during the month covered by the statement.

ARTICLE III.

It is mutually agreed by the parties hereto:

1. For the purposes of this agreement, an "exchange" of the Subscribing Company means a system consisting of a switchboard (or switchboards, in the case of a multi-office exchange) which has been or may be connected, as herein provided, by trunk lines with a switchboard, designated by the Bell Company, of a connecting exchange of the Bell Company and also connected with the stations of subscribers in such exchange of the Subscribing Company at the exchange rate in such exchange (including therein local public telephone pay stations). No station to which the subscribing company makes a toll charge for connection with an exchange of the Subscribing Company (except local public telephone stations as above included) shall be considered under this agreement as within that exchange. This agreement contemplates, however, that a toll station of the Subscribing Company may, in some cases, be connected with an exchange of the Bell Company only by special agreement in each case, and that each such toll station which it is desired to connect with an exchange of the Bell Company shall be deemed an exchange, for the purposes of this agrement, and treated hereunder in all respects accordingly.

2. In the handling of all communications interchanged hereunder and as herein provided, the Bell Company shall at all times make the toll line connections desired by the Subscribing Company and operate, control and supervise the operation of the entire toll circuit involved in establishing such connections, and the Subscribing Company shall only be required to make such switchboard connections, and to perform such operating of the switchboard of each of its exchanges connected, as herein provided, with a connecting exchange of the Bell Company, as may be requisite to connect the stations of its subscribers in such exchange with the switchboard of such connecting exchange of the Bell Company.

3. No interchange of telephonic communications shall be required or permitted hereunder in either direction between the subscribers of the Subscribing Company in any exchange connected, as herein provided, with a connecting exchange of the Bell Company and the subscribers in any other exchange reached by the lines of the Bell Company and located within a radius of fifty miles from such exchange of the Subscribing Company, measured by air-line distance between such exchange of the Subscribing Company and the exchange serving the subscriber called or calling; such measurements to be made on the post route maps published by the United States Post Office Department and between the points indicated on such maps as the localities in which such exchanges are respectively located; provided, however, that the Bell Company will, upon request, accept "long lines business" without limitation as to distance and without the connection charge hereinafter specified. "Long line business" means those connections classified as such in accordance with the contracts and traffic arrangements between the American Telephone and Telegraph Company and its associated companies as applicable on the nineteenth day of December, 1913, to any connecting exchange contemplated hereby.

4. The tolls for all communications interchanged hereunder and originating at an exchange of the Subscribing Company connected, as herein provided, with a connecting exchange of the Bell Company shall belong to the Bell Company and shall be as follows: For all such communications to subscribers served by any exchange located at a distance of fifty miles or more, measured as hereinbefore provided, from such exchange of the Subscribing Company and reached over the toll lines of the Bell Company, the regular tolls, between the exchanges in which, in each case, such communications originate and terminate, from time to time established by the Bell Company and, in addition thereto, a connection charge of ten (10) cents for each such

communication, to be paid by the Subscribing Company to the Bell Company; for all such communications classified, as hereinabove provided, as "long lines business," whether to a point located within or beyond a radius of fifty miles from such exchange of the Subscribing Company, the regular tolls from time to time established therefor by the American Telephone and Telegraph Company, and without any connection charge in addition to such tolls.

The tolls for all communications interchanged hereunder and originating on the lines of the Bell System and at any exchange connected, under an agreement similar hereto, with any connecting exchange of the Bell Company or of the other companies in the Bell System, and terminating in any exchange of the Subscribing Company connected, as herein provided, with a connecting exchange of the Bell Company, shall belong to the Bell Company, and shall be the regular tolls aforesaid properly applicable to such communications and, in addition thereto, a connection charge of ten (10) cents for each such communication, to be paid by the subscriber originating the call and to be retained by the Bell Company, whenever a connection charge, in addition to the regular toll, would be chargeable hereunder to the Subscribing Company if such communication had originated at the station of the subscriber called. Calls on which charges are reversed, if and when such calls are permitted by the established rules and regulations of the Bell Company, shall be considered, for the purpose of this agreement, as originating at the station against which the charge is to be made, and shall be subject to the limitations and charges specified in this section and in the next preceding Section 3 hereof.

5. A separate application, in the form hereto annexed, marked "A," shall be made by the Subscribing Company for each exchange which it may desire to connect hereunder with an exchange of the Bell Company. The requisite information to enable the Subscribing Company to properly fill out each such application will be furnished by the Bell Company whenever requested by the Subscribing Company.

6. The Bell Company shall not in any event be liable to the Subscribing Company for any accidents, damages, losses or costs incurred at, on or in connection with the plant of the Subscribing Company in any exchange connected, as herein provided, with a connecting exchange of the Bell Company, or for the quality of the service, or for the failure of any conversation for any cause whatsoever, resulting from such connection and not due to the negligence of the Bell Company, and, whenever in any case such a plant of the Subscribing Company is not maintained in a condition to afford efficient service over the trunk lines connecting it hereunder with such connecting exchange of the Bell Company, the Bell Company may discontinue the service until the defective condition is remedied.

7. Should any differences hereafter arise under this agreement concerning any of the matters provided for in Section 1 of Article II and in the next preceding Section 6 hereof, which affect or involve the efficiency of the service rendered through the connection afforded by the Subscribing Company's trunk lines connecting hereunder any exchange of the Subscribing Company with a connecting exchange of the Bell Company, the subject of any such difference shall be referred to arbitration; one arbitrator shall be chosen by the Bell Company, one by the Subscribing Company, and a third, who shall be a competent and disinterested party, by the two so chosen. If either company shall fail to appoint its arbitrator within fifteen (15) days after the company desiring arbitration has appointed its arbitrator and given written notice to the other of such appointment and of the matter to be arbitrated, then the company desiring arbitration shall appoint an arbitrator for the one in default, and the two so appointed shall select a third arbitrator. If the two arbitrators chosen in either of said ways shall fail, within fifteen (15) days after their appointment, to choose a third arbitrator, then such third arbitrator may be selected by the chairman of the state commission or other state board, if any, having supervision over telephone companies in the state in which the Subscribing Company operates any such exchange, or, if there should be no such commission or board in that state, then such third arbitrator may be selected by the chairman of the Interstate Commerce Commission. The decision of said arbitrators, chosen in any of said ways, or that of a majority of them, shall be final and conclusive. The expense of such arbitration shall be paid by the company against which the arbitrators decide. If their decision is partly against one and partly against the other, the arbitrators shall direct the proportionate distribution of the expense.

8. If the Subscribing Company shall fail to pay any sum due hereunder within fifteen (15) days after the same shall become due or payable and after demand for the payment thereof, or shall violate any of the other provisions of this agreement and such violation shall continue for thirty (30) days after written notice thereof from the Bell Company, the Bell Company may, at its option, thereupon by written notice terminate this agreement; provided, however, that in case the Subscribing Company shall, except as herein provided, connect the toll lines of the Bell Company with the exchange or toll lines of any individual, firm or corporation other than an exchange of the Subscribing Company, connected hereunder by its trunk lines with a connecting exchange of the Bell Company, the Bell Company shall have the right thereupon to terminate this agreement without notice.

9. Wherever in this agreement notice is provided to be given by either party hereto to the other, such notice shall be in writing and given by letter mailed, or by personal delivery, to the Bell Company at its office at.....or to the Subscribing Company at its office at....., as the case may be, or to such address as either party may from time to time designate in writing for that purpose.

10. The failure of either party hereto to enforce or insist upon compliance by the other party of the terms and conditions of this agreement, or the waiver by either party of the same in any instance or instances, shall not be construed as a general waiver or relinquishment on its part of any such terms or conditions, but the same shall be and remain at all times in full force and effect.

11. The covenants and agreements herein contained shall run to and be binding upon the parties hereto, their successors, legal representatives and assigns, and to and upon any other person, firm or corporation which may hereafter own or operate the property of either party.

12. Unless sooner terminated as hereinbefore provided, this agreement shall continue in force for the term of ..... years from and after the date first hereinabove written and thereafter until the expiration of thirty (30) days after notice of termination given in writing by either party hereto to the other.

In witness whereof the party of the first part has signed its corporate name and affixed its corporate seal and the party of the second part has signed its corporate name and affixed its corporate seal to this agreement in duplicate the day and year first hereinabove written.

By.....Company.
Attest: Secretary.
By.....Company.
Attest: Secretary.

APPENDIX A.

Application for Qualified Toll Line Service.

Pursuant to the agreement for qualified toll line service dated the .....day of....., 19..., between the.....Company (therein and herein called the "Bell Company") and the.....Company (therein and herein called the "Subscribing Company"), the undersigned hereby applies to the Bell Company for permission to connect, for the purposes and in the manner provided in said agreement, the switchboard of the telephone exchange of the Subscribing Company at ..... with the switchboard of the telephone exchange of the Bell Company at ..... and hereby requests the Bell Company, upon its acceptance of this application and after the proper completion of the connection herein applied for, to furnish, in accordance with the terms and conditions of said agreement, the qualified toll line service therein provided for.

The Subscribing Company hereby further requests the Bell Company .....

All sums payable by the Subscribing Company to the Bell Company, in accordance with the provisions of Section 5 of Article II of said agreement, for telephonic communications originating at the Subscribing Company's exchange, specified in this application, shall be paid to the Bell Company at its office in .....

The annexed schedule is hereby made a part of this application.

The toll line service covered by this application may, without affecting said agreement, be discontinued at any time by thirty (30) days' previous written notice from the Subscribing Company to the Bell Company. But upon the termination of the agreement to which this is supplemental the Bell Company shall have the right without notice to discontinue the service covered by this application.

Dated this.....day of.....19...
By.....Company.
Accepted the ..... day of .....19...
By.....Company.

SCHEDULE.

A.—No interchange of telephonic communications will be permitted between the subscribers of the Subscribing Company in the exchange specified in the within application and the subscribers of the Bell Company, of its connecting companies, of the other companies in the Bell System or of companies under agreements, with the Bell Company or with the other companies in the Bell System, similar to the agreement under which the within application is made, in any exchange located within a radius of fifty miles, air-line distance, from the Subscribing Company's exchange specified in the within application, except to the exchanges named below and classified as "long distance lines" points, and to which points the American Telephone and Telegraph Company's toll rates will apply without any connection charge.

B.—A connection charge of ten (10) cents, in addition to the regular toll, will be made for each communication to an exchange distant fifty miles or more from the Subscribing Company's exchange specified in the within application, and within..... except to the exchanges named below and classified as "long distance lines" points, and to and from which points the American Telephone and Telegraph Company's toll rates will apply without any connection charge.

C.—No connection charge in addition to the regular tolls will be made for communications to exchanges beyond the limits of the zone described in "B" hereof, except to the exchanges named below and classified as "Bell Company" toll line points, and to and from which points the Bell Company's toll rates will apply and in addition thereto a connection charge of ten (10) cents for each such communication.

STATISTICS OF TELEPHONE SERVICE IN THE UNITED STATES

Table Prepared by the American Telephone & Telegraph Company

Division and State	Single Service Points				Dual Service Points			Grand Total
	Bell	Connecting	Independent	Total	Bell and Independent	Connecting and Independent	Total	
New England—								
Maine	96	111	28	230	18	15	33	263
New Hampshire	80	36	7	123	13	2	15	138
Vermont	51	70	14	135	6	8	14	149
Massachusetts	243	18	5	266	3	1	4	270
Connecticut	67	5	...	72	...	...	...	72
Rhode Island	25	3	...	28	...	...	...	28
Total	562	243	49	854	40	26	66	920
Eastern—								
New York	322	362	92	776	89	28	117	893
New Jersey	144	26	6	176	37	2	39	215
Pennsylvania	160	200	223	583	240	92	332	915
Delaware	23	2	1	26	1	...	1	27
Maryland	98	35	5	138	5	...	5	143
Virginia	59	219	28	306	3	3	6	312
West Virginia	45	152	84	281	29	30	59	340
Total	851	996	439	2,286	404	155	559	2,845
Central—								
Ohio	72	549	251	872	112	43	155	1,027
Indiana	87	603	136	826	49	18	67	893
Illinois	177	738	175	1,090	72	92	164	1,254
Michigan	130	237	140	507	76	58	134	641
Wisconsin	82	415	64	561	16	18	34	595
Total	548	2,542	766	3,856	325	229	554	4,410
Southern—								
Kentucky	120	173	95	388	55	13	68	456
Tennessee	108	120	95	323	52	8	60	383
North Carolina	70	231	28	329	6	7	13	342
South Carolina	54	130	9	193	1	...	1	194
Georgia	100	293	13	406	1	1	2	408
Florida	10	93	3	106	...	...	...	106
Alabama	73	190	9	272	4	2	6	278
Mississippi	119	68	29	216	14	1	15	231
Louisiana	92	60	2	154	5	2	7	161
Total	746	1,358	283	2,387	138	34	172	2,559
Northwestern—								
Minnesota	55	392	64	511	48	9	57	568
North Dakota	58	263	...	321	1	1	2	323
South Dakota	27	223	18	268	...	21	21	289
Iowa	146	794	35	975	14	6	20	995
Nebraska	86	404	24	514	8	18	26	540
Total	372	2,076	141	2,589	71	55	126	2,715
Southwestern—								
Missouri	65	860	92	1,017	41	48	89	1,106
Kansas	73	632	55	760	15	24	39	799
Oklahoma	118	429	...	547	6	3	9	556
Arkansas	99	186	50	335	4	7	11	346
Texas	211	603	143	957	68	30	98	1,055
Total	566	2,710	340	3,616	134	112	246	3,862
Mountain—								
Montana	25	44	10	79	21	...	21	100
Idaho	54	35	15	104	17	2	19	123
Wyoming	23	22	7	52	2	...	2	54
Colorado	146	56	4	206	6	...	6	212
Utah	38	28	...	66	...	...	...	66
New Mexico	27	33	5	65	...	...	...	65
Arizona	27	18	11	56	...	...	...	56
Total	340	236	52	628	46	2	48	676
Pacific—								
Washington	77	158	6	241	24	7	31	272
Oregon	63	142	14	219	7	9	16	235
Nevada	4	17	12	33	...	1	1	34
California	336	173	11	520	45	...	45	565
Total	480	490	43	1,013	76	17	93	1,106
United States	4,465	10,651	2,113	17,229	1,234	630	1,864	19,093

The figures in the first column give the points where only the Bell companies furnish service; the second column, the points where service is provided by independent companies having connections with the Bell System; the third column, the points where service is furnished only by independent companies; the filth column gives the figures as to points where the Bell and independent companies have competing exchanges; and the sixth column, points where connecting, mutual or independent companies have competing exchanges. There are, therefore, 1,864 points where there are two exchanges, making a grand total of 20,957 telephone exchanges in the United States.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

TELEPHONE pre-payment instruments used by the German telephone and telegraph department are either equipped with a special cash receptacle, or else the latter is built into the telephone. In some of these telephones the toll is paid after notifying the exchange and being asked by the operator for the coin. All cash instruments are arranged in such a manner that an audible signal is given the exchange operator when the cash is deposited in the box. In the older instruments the coin passing through the slot closed a shunt to the microphone battery. While the coin goes on, current changes occur in the microphone current circuit, which are heard in the receiver of the operator as a buzzing noise. The instruments of more recent construction have a gong against which the money strikes in falling. The sound produced is thus transferred mechanically to the telephone of the operator. Similar in effect is the process in telephones having a separate money box. Here a lever must be pulled forward after the money is deposited, thus sounding a gong by means of a spring. This sound is also transmitted mechanically to the operator as was shown before. The lever is not to be moved, however, until the operator asks for the money. If this is not done she cannot hear the sound of the gong and cannot watch over the receipt of the toll. To receive the money automatically, and not with the aid of the operator, special instruments are required. Such instruments have great advantages over those of the older types, since with them automatic calls can be handled exactly like the ordinary subscribers' calls. The operator need not ask for the coin nor watch that it is deposited. This results in a saving of time that may be considerable in larger exchanges. Such automatic telephones will also prevent a person from using the telephone without paying for his call and will prevent double payment of tolls through the error of either the caller or the operator. The opinion of men in the telephone field is that these automatic instruments ought to be constructed in such a way that the exchange can be reached only after the coin has been deposited in the machine. If the call is made, the coin drops into the cash box; if it is not made the coin is returned to the caller. The coin will therefore be given a waiting position. It depends also on the question whether payment for the entire call is to be made after completing the call, depending on the time consumed by the caller, or whether he is to pay for the entire call first. At any rate return of the money will be simultaneous with the disconnecting of wires by the operator. An instrument meeting above condition is shown in Fig. 1 and described.

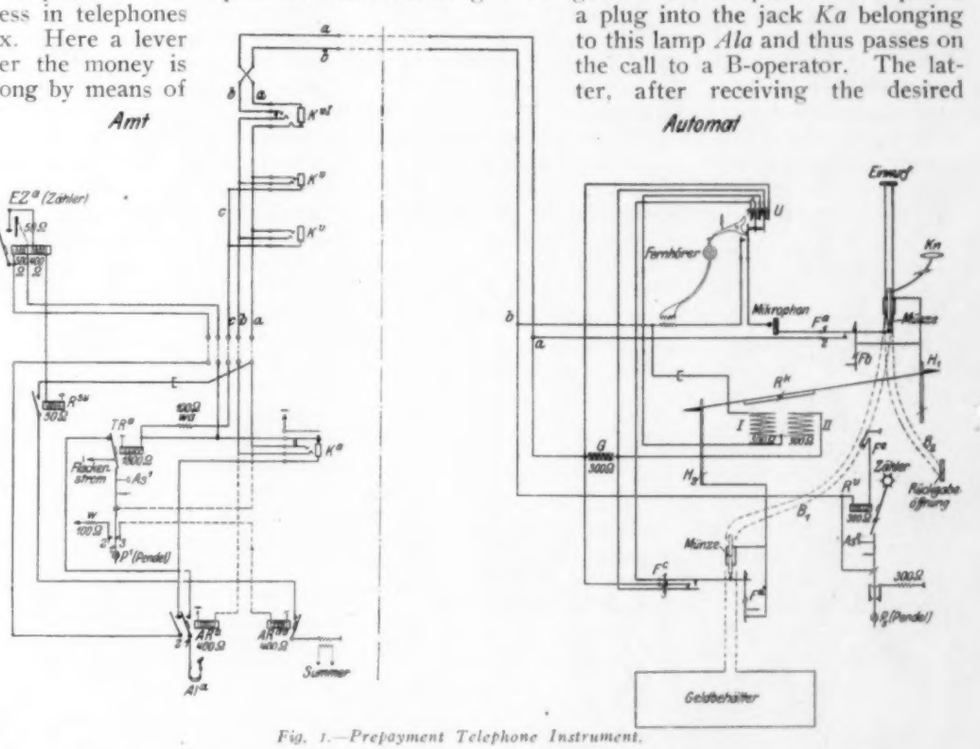


Fig. 1.—Prepayment Telephone Instrument.

The exchange is supposed to have common battery system and full automatic registering of calls, *i. e.*, the registering apparatus begins to work as soon as the operator connects to receive the desired number. The other system where the registering device begins its work only after the desired connection has been made is called semi-automatic. The call is made by removing the receiver. The diagram for the exchange wiring is seen in Fig. 2 and is identical for both systems.

The relay *ARa* operates and passes current to the call lamp *Ala* over the attracted armature and the armature *TRa* which is not yet attracted. *Ala* flickers. In the Hamburg exchange it is the A-operator who places a plug into the jack *Ka* belonging to this lamp *Ala* and thus passes on the call to a B-operator. The latter, after receiving the desired number, tells the C-operator on the trunk line the number of the subscriber line used at the A-board. The C-operator, who makes the actual connection, is now enabled to make the proper connection. While she places the plug into the jack *Kv* of the desired subscriber line, calling current is sent into this telephone from the exchange. This current rings automatically until the subscriber answers. When the first current impulse is sent to the telephone, the call registering apparatus *EZa* receives current and is in connection. Its armature is held and its gears travel on by one space only when the holding coil of the relay *EZa* becomes currentless. This is done when the operator disconnects. When using an apparatus as shown in Fig. 1, the removing of the receiver releases at first only the opening for the coin (not seen in

the figure). Only after dropping the coin can the exchange be reached. The coin falls upon the upper spring of contact *Fa* and closes the feed current circuit. *Ara* connects and *Ala* flickers. Aside from *ARa*, relay *ARaa* also receives current. This relay takes the place of the second coil of *ARa*, the feed relay of the usual exchange wiring system (see Fig. 2). The automatic call is handed on, as usual over the B- and C-operator boards. When placing the plug in *Ka*, *TRa* calls. Its armature has to remove the little pendulum *Pl* from its rest position—in the diagram from right to left—and to keep it in the new position until *TRa* becomes currentless after disconnecting. When the armature of *TRa* falls away, P_1 returns to the rest position. With this proceeding current is sent to the *a*-branch of the automatic telephone line, and at the same time the relay *ARaa* is cut out.

Suppose the desired line is busy. The caller at the automatic instrument hangs up his receiver and waits or else does not call at all. As the call was not made the money must be returned. This is done a few seconds after hanging up the receiver, as soon as the A-operator has removed the plug from *Ka* jack. Then *TRa* becomes currentless, the armature falls away, pendulum P_1 swings, and current flows over its springs *2* and *1* into the *a*-branch of the pre-payment telephone and then through the coil *II* from the polarized relay *Kk* in the same instrument over the hook switch *U* to earth. *Rk* connects and releases the lever H_1, which is to be imagined in the form of a cover. The lever H_1, which has held the coin with its upper arm, turns to the right and the money falls back down the return slide B_2 and into the caller's hand. At the same time the contact *Fa* in the telephone is

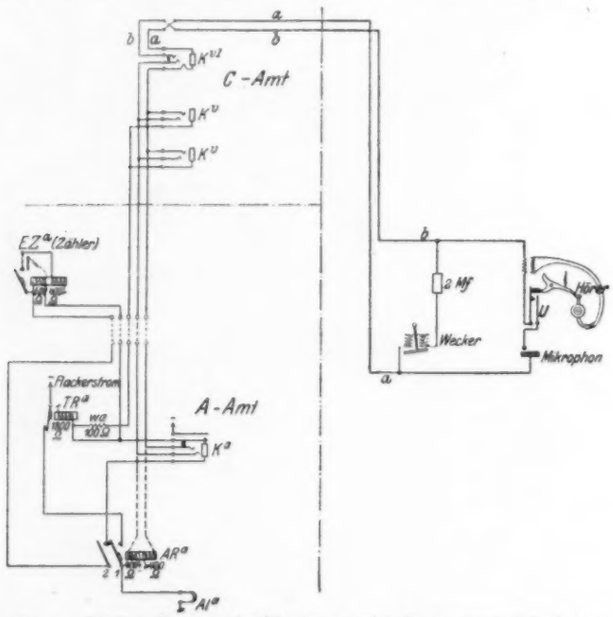


Fig. 2.—Wiring Diagram for Exchange with Prepayment Telephones.

opened, as its spring is not weighed down any more by the coin, and since, after the falling off of lever H_1, it is also liberated from the spring stop *Fb*. The latter is to aid in closing and locking the contact *Fa* better than would be done by the coin alone. With lever H_1, lever H_2 has also fallen off.

As soon as the receiver is removed for a second call (not visible in the figure), the receiver hook pushes the two levers H_1 and H_2 over the heads of the armature of *Rk* and the money which is deposited finds the return-money slide B_2 closed by the upper arm of H_1. Suppose now the desired call has been made. When the first call current impulse is sent out, the call register *EZa* in the exchange operates, as also the relay *Rsu*, which is in series with the holding coil of relay *EZa*. Then a buzzer current is sent over the attracted armatures of *ARaa* and *Rsu* to the *a*-branch of the pre-payment telephone. The buzzer sound prevents all conversation and is only silenced when the subscriber at the other pre-payment telephone has pushed on the red button *Kn*, and has thus removed the coin from its waiting position. The money now falls through the cash slide B_1 upon the spring *1* of contact *Fc*. The contact *Fa* remains locked by means of its spring *1* in spite of its distance from the coin, because this spring is now held by the locking spring *Fb*, which is done until the receiver is hung up, and lever H_1 falls away. The latter takes place only when the line is disconnected. The coin falling upon *Fc* moves spring *1* towards spring *3* and at the same time removes the latter from spring *2*. Through this the *a*-branch of the prepayment telephone is grounded over *G*, the springs *3* and *1* of *Fc* and the springs *1* and *2* of switch *U*. The result is that at the exchange the armature falls away from *ARaa* and the buzzer is interrupted. Contact *Fc* is held by the locking spring *Fd*. The induction coil *G* must have the same impedance for telephone currents as the relay *Rk*. As soon as the exchange disconnects the lines, *TRa* becomes currentless, the pendulum P_1 swings and sends (—) current into the *a*-branch of the telephone line. *Rk* in the telephone is operated; the lever H_2 falls away, the money drops into cash box, the locking springs *Fb* and *Fd* take their rest position and the contacts *Fa* and *Fc* open.

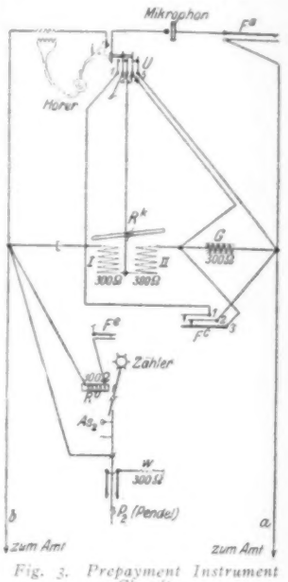


Fig. 3. Prepayment Instrument Circuit.

It is not impossible that the buzzer might cause disturbances in neighboring lines. Should this be the case, the ground would be removed from the secondary coil of the buzzer coil, and a special connection would be made over the two relays *ARaa* and *Rsu* and a condensor to the *b*-branch of the pre-payment telephone line. Then the buzzer would be connected to the telephone on both sides without the use of earth and would not be able to influence neighboring lines. The two relays *ARaa* and *Rsu* would have to receive another working contact each.

The question still remains how suburban calls and night calls would be handled. Here there is some trouble and the above arrangement cannot be used. It will not be possible to have the buzzer ring before beginning the suburban call. For night calls the first coin can be deposited, but not the second one. While it would be possible to change the pre-payment telephones so that two coins will be registered with the same connection at the exchange, this would entail complex mechanism and is not advisable. We may assume that these automatic telephones are used mostly during the day and for local calls and will help to relieve the exchange operators during rush hours. For night and suburban calls it seems

to be perfectly feasible for the operator to watch the automatic telephone then speaking for the receipt of the coin and of the right amount. The telehone need only be equipped with a device which will give the operator an audible signal when the coin is deposited. This is answered by using the relay *Rv* and pendulum P_2. The night or suburban call operator, recognizing from her number that she has a call from an automatic telephone, requests the caller to push on the red button *Kn*. The coin and of the right amount. The telephone need only slide, the contact *Fe* for a moment, and completes a battery current circuit, comirg from the *b*-branch of the line over the relay *Rv*. The armature of *Rv* is attracted for a moment, and the pendulum P_2 is removed from its rest position. P_2 returns immediately, though, to the screw As_2, striking this as it does so. Its middle spring swings a few seconds, and while in rapid vibration it touches one and then the other of the two outside springs; it closes and opens the battery current circuit coming from the *b*-branch of the prepayment line. The oscillations of the pendulum are heard by the operator as a buzzing noise. The second coin is brought in the same way from the waiting to the cash position. The removal of the coins into the cash box follows automatically the operation of the prepayment telephone relay *Rk* when disconnecting at the exchange. The relay *Rk* should be constructed like the relays of the registering instruments in the exchange. Its registering gears, that pass on one unit every time that a coin passes through the cash slide B_1, should show the receipts for all the calls made, while the register at the exchange shows only the night and suburban calls. Fig. 3 shows the wiring for the prepayment telephone instruments.—*Elektrotech. Zeit.*

IMPROVEMENT OF SUBMARINE TELEPHONE COMMUNICATION BY MEANS OF INDUCTIVE SHUNTS.

AS EARLY as 1893 Professor Silvanus Thompson had proposed the use of inductive shunts to improve submarine telephone communication, without, however, giving any information as to the details and the use of the coils to be employed. According to his theory it would

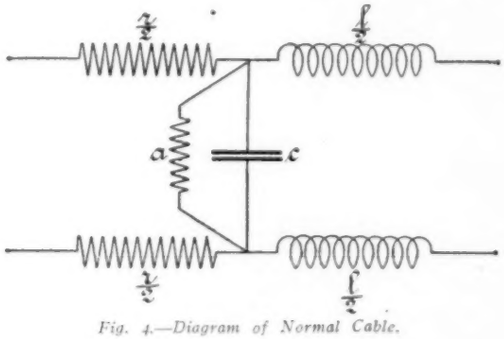


Fig. 4.—Diagram of Normal Cable.

have been necessary to use spools of great ohmic resistance, whereas in reality this resistance must be very small. We can represent a cable like the one shown in Fig. 4 where *r* is the resistance in ohms, *i. e.*, the total resistance of two wires for a cable 1 km. in length; *l* is their self induction and *c* their capacity; *a* is the insulating resistance and its reverse is designated by *g*. If ω designated the pulsating ($\omega = 2\pi f$, *f* being the frequency) and $i = \sqrt{-1}$; the impedance of these elements in series in the cable will be $r + j\omega l$, and the admittance of these in shunt will be $g + j\omega c$. The value of the damping coefficient will then be:

$\beta = \sqrt{(r + j\omega l)\ (g + j\omega c)}$, (1) a value which gives the well known differential equations of diffusion of currents.

If we place in the shunt between the two conductors of the cable an inductive shunt as shown in Fig. 5, the solution of the equation becomes, if not impossible, at least very difficult.

Roeber has given a solution for it, in which he supposes *g* to be negligible. If *m* is the number of coils

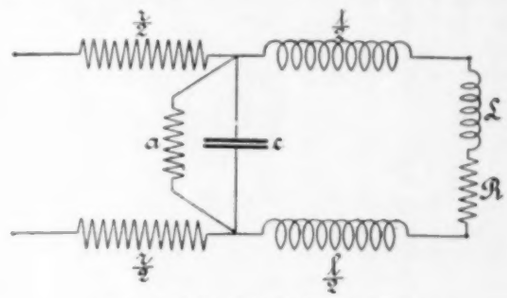


Fig. 5.—Cable with Inductive Shunt.

placed in shunt per kilometer cable, *R* their resistance in ohms, and *L* their self inductance, he gives for the value of the resistance and the self induction per kilometer of shunted cable:

$$l_1 = l - \frac{2m}{\omega c l} \cdot \frac{rR + \omega^2 Ll}{R^2 + \omega^2 L^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$r_1 = r - \frac{2m}{cl} \cdot \frac{Lr - LR}{R^2 + \omega^2 L^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

According to these equations the effect would be to diminish at the same time the resistance and the self induction of the cable. If these formulas were applicable it would be easy to obtain efficient submarine telephone communication. In pupunizing a cable, already strengthened by inductive shunts, one would return to it its self induction and would decrease the damping effect. Then, when placing new shunts one would diminish the resistance still further, and in continuing so, would at last have a cable of very low resistance and a damping effect equal to zero. In reality the theory of Roeber is not applicable. Paper cables, when new, have an insulating resistance of 1 megohm, and *g* for them would be $g = 10^{-6}$; for older cables this value will be $g = 10^{-5}$. We could estimate for very good cables *g* to be equal to 10^{-6}, 0.8. All these values are not negligible.

We can estimate the value of *g* in this way: The impedance of the elements in series is always $r + j\omega l$, but the admittance, in the case of a single coil in shunt, has taken the value

$$g + j\omega c + \frac{1}{R + j\omega L} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

this can be written:

$$g + j\omega c + \frac{R - j\omega L}{R^2 + \omega^2 L^2} = \left(g + \frac{R}{R^2 + \omega^2 L^2}\right) + j\left(\omega c - \frac{\omega L}{R^2 + L^2\omega^2}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

We then reduce from these the damping effect, which we call

$$\beta = \sqrt{(r+j\omega l)\left[\left(g+\frac{R}{R^2+\omega^2L^2}\right)+j\left(\omega c-\frac{\omega LR}{R^2+\omega^2L^2}\right)\right]} \quad 6)$$

The spool in parallel will then be used to increase g by the quantity: $\frac{R}{R^2+\omega^2L^2}$ and diminishing ωc by $\frac{\omega L}{R^2+\omega^2L^2}$ with influencing r or l.

Let us take for example a spool of 10,000 ohms, 1 henry, and let us suppose that the pulsating be $\omega = 10^4$; we will then have:

$$\frac{R}{R^2+\omega^2L^2} = 0{,}5.10^{-4}$$

$$\frac{\omega L}{R^2+\omega^2L^2} = 0{,}5.10^{-4}$$

The use of such a spool on a cable, for which we have $g = 0.5.10^{-5}$ and $c = 0.2.10^{-6}$ farads, will assure its hyper-compensating effect, but its insulation will be reduced to one-eleventh of its first value. Table I given here allows us to give an account of this influence of the resistance of the shunt coils on the insulation of the

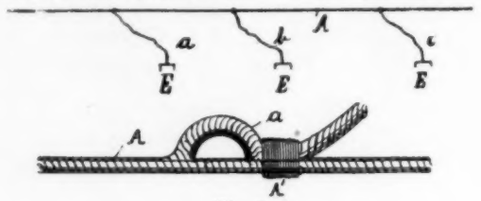


Fig. 6.

cable in supposing that $\omega = 10^4$, $L = 1$ henry, and $g = 10^{-6}$.

TABLE I.

R—Ohms.	$\frac{R}{R^2+\omega^2L^2}$	Relative Increase of g
1	$\frac{1}{100{,}000{,}001}$	0.01 g
10	$\frac{1}{10{,}000{,}010}$	0.1 g
100	$\frac{1}{1{,}000{,}100}$	1.0 g
1,000	$\frac{1}{101{,}000}$	10 g
10,000	$\frac{1}{20{,}000}$	50 g
100,000	$\frac{1}{101{,}000}$	10 g

We see then how much the insulation decreases when the resistance of the spool increases; if it falls to 20,000 ohms, we would have $R = 10{,}000$ ohms, instead of 1 megohm; communication would not be possible. It is explained in this way that one cannot have practical results with coils of as great resistance as those proposed byThompson. In reality the insulating effect does not decrease indefinitely. It reaches a minimum value and then grows again; we see by the above table that it has the same value for $R = 100{,}000$ ohms as it has for $R = 1000$ ohms; but it has no compensation for the caacity, the self-induction grows little. If, with the given values, we suppose that the capacity per kilometer c is 0.2 microfarads per kilometer, we will have

$$\omega c - \frac{\omega L}{R^2+L^2\omega^2} = [0{,}2 - 0{,}0001]\ 10^{-2}$$

The variation of the capacity will then only be 0.0001 microfarads, which we can then neglect. Thompson always indicates the use of high resistance coils in his patents. We must not forget that the coils are distributed along the entire length of the cable, and that if we place, for example, a coil of 10,000 ohms every ten kilometers, we could theoretically substitute for it 10 coils of 100,000 ohms placed every kilometer. We will see that the insulating effect remains large enough, but there is no appreciable compensating effect. The use of coils with high resistance seems so intimately associated with Thompson's ideas that it has been suggested to call cables equipped with these "Thompson cables," and to reserve the name of "cable with inductive shunts" for those having coils of resistances from 0.1 to 100 ohms.

To test the conclusions drawn previously, we have tried out inductive shunts on a cable 37 kilometers in length, whose constants per km. were: $r = 40$ ohms; $c = 0.04$ microfarads. The self inductance and the conduction g have not been measured, but we can estimate them at 10^{-4} henry for l and between 10^{-5} and 10^{-6} henry for g. For shunts, the simple Pupin coils were employed. Their self induction was 0.1 henry; their resistance in ohms equal to 2 ohms for direct current, and was raised to 28 or 30 ohms for high frequency currents ($\omega = 10{,}000$). The coils were placed at 6 kilometer intervals of cable.

One of the curious results was the change in the voice, which became hard and piercing. This fact is easily understood when we consider the influence of the frequency on the impedance, as Table 2 shows.

Table II.—Effect of Coils on the Different Frequencies.

R-OHMS	L-HENRYS	w	w^2L^2	$R^2+w^2L^2$	$\frac{R}{R^2+w^2L^2}$	$\frac{L}{R^2+w^2L^2}$
1	1	1	1	2	0.5	0.5
1	1	10	100	101	10^{-2}	10^{-2}
1	1	10^2	10^4	10^4+1	10^{-4}	10^{-4}
1	1	10^3	10^6	10^6+1	10^{-6}	10^{-6}
1	1	5.10^3	25.10^6	25.10^6+1	4×10^{-8}	4×10^{-8}
1	1	10^4	10^8	10^8+1	10^{-8}	$\frac{10}{10^{-8}}$

For the lower frequencies the insulation is very much weakened; the cable is short circuited. It is that which produces this new quality in the voice, which is not disagreeable, however. It becomes less distinct, but this effect could be avoided by employing condensers in series with the coils.

We indicate the following result by calculating the inductive shunts. The impedance being $r + j\omega l$, and the conductance $g + j\omega c$, the damping effect is:

$$\beta \sqrt{(r+j\omega l)\ (g+j\omega c)}$$

It is smallest when $\frac{r}{\omega c} = \frac{g}{\omega c}$

We obtain this result in considering r, l, g, and c as variables in the equation

$$\frac{r}{\omega l} = \frac{g+\frac{R}{R^2+\omega^2L^2}}{\omega c-\frac{\omega L}{R^2+\omega^2L^2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

basing the same on equation (6).

Numerical Estimate: Let us assume $\omega = 10^4$, and to have the estimates a little simpler, assume $\omega = 5.10^3$. Let $r = 1$; $l = 10^{-4}$; $g = 10^{-5}$; $c = 0.2 \times 10^{-6}$; these values have been figured on the basis of the constants in actual practice and are therefore near those of practical work. We shall impose the condition that the decrease

in insulation will not exceed 10 per cent. We will then seek the values of R and L. We will then have:

$$\frac{r}{\omega l} = \frac{1}{10^{-4}.10^{-4}} = 1.$$

and in consequence of the change allowed for insulating effect:

$$g + \frac{R}{R^2 + \omega^2 L^2} = 1.1\ g = 1.1 \times 10^{-5}$$

and we will have

$$1.1 \times 10^{-5} = 0.2 \times 10^{-6}.10^{-4} - \frac{10^4 L}{R^2 + 10^8 L^2}$$

or:

$$\frac{10^4 L}{R^2 + \omega^2 L^2} = 0.2 \times 10^{-2} - 1.1 \times 10^{-5} = 198.9 \times 10^{-5}$$

with: $\dfrac{R}{R^2 + \omega^2 L^2} = 0.1\ g = 10^{-6}.$

From which we get: $\dfrac{R}{10^4 L} = \dfrac{1}{1989}$ and finally: $R = 0.25$ ohms; and $L = 50 \times 10^{-3}$ henry. The damping effect in these values is $\beta = 3.1 \times 10^{-3}$. A cable thus equipped could be used for a distance of 1000 km., and for the length β would only be equal to 3.

We have already said that transmission would be better in proportion as the frequency is greater. The result is that the voice is slightly suppressed, but at the same time is rendered more distinct. In effect, it is the sibillants, the vowels *u* and *i*, which are the first to disappear. The cable with inductive shunts has an advantage over the pupinized cable. It would not be a question in the first place of pupinizing a cable of such a small resistance, for one would increase this resistance considerably by the use of the coils, and the result would be very poor communication. The pupinized cables, moreover, are very sensitive to accidental changes in insulation. This is not true for the shunted cables, for their reversal is, as we have seen: $g + \dfrac{R}{R^2 + \omega^2 L^2}$, and the second term is, in respect to g, sufficiently large to make this last quantity negligible.

According to our ideas, submarine telephone cables for long distances will use a single wire, if they are to be economical. If this is done there will be no bad effects when the inductive shunts absorb the low frequency currents, which are the ones that cause the attendant noises in telephone conversation. The employment of single conductor cables with inductive shunts is easily accomplished, for the coil need not have a great insulating effect, since it must be connected to the ground or the covering of the cable. Fig. 6 shows a solution of the problem for submarine cables, proposed by Thompson.

$$\frac{r}{l\omega} \times \omega c = g + A$$

It must be added that the insulation of such a cable must remain constant, and that there is still much to be done to reach that stage. It is not very convenient to make a coil of a small enough resistance for submarine telephone cables. Table III shows us, in fact, that for increasing capacities of cables, it is necessary to decrease the resistance and the self induction of the shunt coils.

Table III.

c — MICROFARADS	R — OHMS	L — HENRYS
0.2	0.2527	$50{,}27.10^{-3}$
0.4	0.0628	$25{,}06.10^{-3}$
0.6	0.0279	$16{,}69.10^{-3}$
0.8	0.0157	$12{,}52.10^{-3}$
1.0	0.0100	$10{,}01.10^{-3}$

Let us add that the increase of the capacity of a cable corresponds to an economy in gutta percha. For Pupin coils it is necessary to increase the self inductance of coils when the capacity grows. For estimating the same, we place:

$$\frac{R}{R^2 + \omega^2 L^2} = A \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

A being the relative increase of g, the reverse of the insulation. If $g = 10^{-5}$, and if we admit an increase of 10 per cent, $A = 10^{-6}$, let us then place $\dfrac{r}{\omega l} = B$. We will have from (7):

$$\frac{g + \dfrac{R}{R^2 + \omega^2 L^2}}{\omega c - \dfrac{\omega L}{R^2 + \omega^2 L^2}} = B \quad \ldots\ldots\ldots\ldots\ldots (9)$$

From equations (8) and (9) we reduce:

$$R = \frac{1}{A + \dfrac{1}{B(AB)}\,[B\omega c - g - A]^2} = \frac{1}{A + D \times E}, \quad (10)$$

$$L = \frac{1}{\omega}.\frac{1}{AB}.(B\omega c - g - A)$$

$$\frac{1}{A + \dfrac{1}{B(AB)}\,[B\omega c - g - A]^2} = \frac{FGH}{A + DE} \quad \ldots (11)$$

in placing

$$D = \frac{1}{B.AB},\quad E = [B\omega c - g - A]^2$$

$$F = \frac{1}{\omega},\quad G = \frac{1}{AB},\quad H = B\omega c - g - A$$

The equations (10) and (11) are then the most general ones applicable. We can easily figure out R and L in forming the equations D, E, F, G, H, in noticing that:

$$L = F\ G\ H\ R. \quad \ldots\ldots\ldots\ldots\ldots (12)$$

When the frequency (and as a result ω grows) L decreases, we will then have coils analogous to those in wireless telegraphy, the cables shunted inductively, allowing the high frequency currents to pass.

In the case where $B\omega c - g - A = O$ we will have $R = \infty$ and $L = O$. This condition is equivalent to:

$$\frac{r}{l} = \frac{g + A}{c} \quad \ldots\ldots\ldots\ldots\ldots (13)$$

$g + A$ is the inverse of the minimum of admissible insulation. The minimum of the damping effect is obtained without having need to any artificial means. The insulating effect must remain the same, whence $R = \infty$.

In the case of submarine cables, the equations can be simplified in actual practice, because r and ωl are nearly equal, and because, as a result we have $B = = 1$ and because $B\omega c$ is always very great when compared with $g + A$, and likewise because A is always small in view of DE. Under these conditions we can write:

$$R = \frac{1}{\frac{1}{A}(\omega c)^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (14)$$

And

$$L = \frac{1}{\omega^2 c} \quad \ldots\ldots\ldots\ldots\ldots\ldots (15)$$

If we calculate R and L from general equations (10) and (11) or (14) and (15), we have the expression for the damping: $\beta = \sqrt{r(g + A)}$, which is its minimum value. This ideal damping effect is hard to obtain with pupinized and Krarup cables, but is easily obtained with inductive shunt cables. For underground cables we can employ the simplified equations (14) and (15); it is also necessary to use equations (10) and (11). Applied to a cable whose constants are: $r = 10$ ohms, $c = 4 \times 10^{-3}$ farads; $g = 10^{-5}$; $l = 10^{-3}$, they give: $L = 0.25$ henry and $R = 6.25$ ohms.

We have tried out the shunting of such a cable, but before calculating L and R by these formulas, we used Pupin coils of 0.1 henry placed in shunt every 6.6 kilometers. The cable was 37 km. long. Table IV gives the values of the damping coefficient.

TABLE IV.

Current Strength in Micro Ampere at Beginning of Cable Line.	Same as I at End of Line.	No. of Periods of Current.	Magnitude of Damping Effect BL.
Cable Without Inductance Coils, Shunted.			
1320	83.25	1500	2.75
1320	126.5	780	2.345
1340	83.25	500	2.78
Cable with Inductance Coils (L = 0.1 Henry; R = 10 Ohms; $C = 10^{-6}$ Farad) Shunted.			
1320	126.5	1500	2.345
1340	243.0	780	1.688
1340	209.7	500	1.86

Without condensors in series with the shunts it is impossible to use the receiving and transmitting instruments used on the cables. For the tests a special apparatus was constructed, being a small alternator, turned by hand, and giving a frequency of 250, and gave good results. After having thus compared the cables using Pupin and Krarup coils, it will be tried in a later article to compare the results in cases where the shunts are reinforced by condensors.—Bela Gati in *La Lumière Eléctrique.*

ECONOMICAL EXPLOITATION OF TELEPHONE DOUBLE LINES.

Telephone double lines represent a heavy investment which ought to be utilized to its fullest extent. The three methods for obtaining this end are: 1. Training the operators properly. 2. Proper use of lines. 3. Proper wiring and use of switchboard, etc. As regards the training of operators, this is especially important for long distance operation. The training should be thorough, embracing both theoretical and practical points. Long distance switchboards should be operated only by experienced operators. Great value is laid on simple rules and these operators should have the tolls at their finger ends. The time for conversations should be accurately measured and charged. As regards the proper management of the lines, care should be taken that the units of calls per time unit as regards number, be in proportion to the length of the lines. For short distances the conversations are usually pretty short and the subscribers do not use the line as long as they might for their toll, but in long distance lines they speak a longer time, and the toll sometimes barely covers the use of the long distance lines. It is also of importance to know whether the lines are used for local or long distance communication, in which latter case they are probably not used as much. In general the length of a call varies between 2.4 and 3 minutes. In this case we can obtain the following values for the long distance lines: *a.* For short lines as high as 20 units per hour. *b.* For long distance lines: *1.* For local traffic up to 19 units per hour. *2.* For local and shorter long distance traffic up to 15 units. *3.* For pure long distance traffic only 13.5. When a line has about 15 calls per hour we usually have to employ one operator for that unit. With very long distance lines we will need more operators for smaller ratios of conversation, while for local work we need one operator for every 18 to 20 calls. Experience has shown that the possibility of utilizing a line fully increases by 2.5 units per hour for every hour of heavy traffic. In one case it was found that where a long distance line was served by one operator alone, where before this same operator had operated not only this but also another line, the gain was 5575 units of calls, equivalent to a saving of $1445, from which we must deduct the salary for the extra operator who had to serve the line formerly served by the long distance operator. As soon as the equipment at hand is seen to be unable to meet requirements, steps should be taken to increase equipment at once, instead of trying to get along on the present outfit. But since the equipment for long distance operation is so expensive, attempts should be made to increase the efficiency first. This can be done either with the buzzer annunciator operation or the trunk line in long distance traffic. In the first case all exchange requests by the operators and reports are made over simultaneous wired telephone lines; in the latter a special inter-exchange trunk line is used for this purpose, which is not used for traffic work at all. The results are satisfactory in both cases, efficiencies rising to 95 percent in the latter case. It might also be possible to use various telephone line branches for buzzer operation or for simultaneous telegraphy, and thus increase their efficiency still further.—*Telgr. u. Fernsprech Tech.*

American Manufacturers Invade Brazil

Bahia's (Brazil) telephone service that had been in use for many years was replaced late in 1912 by an American system. The new equipment was installed by the Companhia Brazileira de Energia Electrica, owned by Guinle & Co., one of the largest public-utility companies in Brazil. The administration of the telephone service is in the hands of American citizens, and the equipment for central exchange use and the material for outside construction work are all of American manufacture. The new service had about 800 subscribers at the end of the year, or five months after its installation. Extensions by means of suburban exchanges are planned in order to provide for 2,000 subscribers. All wires, at present overhead on poles, are to be placed underground, and the outlay for the new system will approximate $1,000,000 when completed by the end of 1913. In equipment and administration the new telephones are giving Bahia a service unsurpassed by any South American city.

The Lay of a Layman

Just a Few Plain Thoughts on Some of the Aspects of the Telephone Business

BY THE T. E. DOPESTER

IT'S a great business. After five years of watchful waiting we find every independent telephone man taking a hitch in his trousers; spitting on his hands and going to it with a vigor that smacks of the good, old days. He begins to see things again, chief of which is his idleness. He realizes that his big competitor has made an advance of nearly seventy per cent while he must be satisfied with a figure two-thirds less than that. The Bell companies, according to government report, have made a growth of sixty-seven per cent in five years, while the independents were scoring only twenty-two per cent. By comparison with any half decade period prior to this, it isn't hard to understand why the independents are ready for an entirely new program.

* * *

The Bell company has declared that it is through as a purchaser of independent properties. This effectually concludes the activities of the telephone promoter who engaged in the business to sell, rather than to operate a telephone system. It encourages those telephone operators who have made a business of the telephone business to develop their systems to the fullest extent possible. Public utility commissioners are apt to have stronger leanings toward the local operator than he has for the foreign operator. The Department of Justice has had its say regarding the subject of telephone competition and the independent operator can now contract with his big competitor on fair terms. There are no terrors left. Independent telephone securities have suddenly come to their own.

* * *

Even among the independent manufacturers there is a feeling of renewed vigor. The Dean Electric Company, one of the chief sufferers due to a general indisposition of operators, has found a new lease of life by a complete reorganization and a change of name. It will be known henceforth as the Garford Manufacturing Company.

* * *

I stumbled across a story a little while ago that purported to show how Charles Howard North got into the telephone business as a manufacturer. Roughly, the time was about 1890 when the Standard Oil Company, smarting under the tariff of the operating telephone companies in those cities where both were operating, determined to go into the matter by making a thorough investigation. The Standard Company turned its chemists and engineers loose on the telephone transmitter with orders to develop a non-infringing instrument, providing such a thing was possible. The result of this study by a staff of experts brought in Charles H. North, who conducted an experimental workshop whose specialty was the development of other people's ideas. As the story goes, the result of all this work brought forth a practical and highly efficient telephone transmitter. This instrument was carefully packed and conveyed to Boston by a delegation of gentlemen selected by the Standard Oil Company, who presented it to the officials of the American Bell Telephone Company with a manifesto that the Standard was prepared to manufacture its telephone without further delay. This committee insisted upon a prompt reply from the Bell people which would voice any possible objection that they might have. It was claimed that the new transmitter was a non-infringing instrument and that if the Bell engineers found anything to the contrary the Standard was to be promptly advised. An incident of this kind would naturally create a flurry among the Bell officials, who were jealously guarding their monopolistic tendencies even in those early days. In due course the Bell people, through a select committee, made its appearance at the New York office of the Standard Oil Company and threatened to retaliate encroachment upon their field by entering into the oil business! It is alleged that the result of this conference, which was followed by a number of other preliminary skirmishes, resulted in an entirely new schedule of rates for Standard service with suitable reimbursement for all past excessive tolls and the payment of all development work on the intruding device. There the matter rested.

* * *

During the time of these negotiations, Mr. North had been building air castles upon the instrument he had formed for the Standard people. It was his belief that the Standard would engage in the manufacture of telephones, using the little instrument he had fashioned for them in accordance with their plans and specifications, as the foundation for the start. When he learned that the two big concerns had adjusted their differences without contemplating the possibilities of a competing telephone manufacturer, his disappointment was very keen. He lost little time in calling at the Standard offices in Cleveland and discovered, somewhat to his surprise, that the arrangement would not prevent him from engaging in the business as a telephone manufacturer on his own account, providing he could make satisfactory arrangement with the Standard people. This he succeeded in doing and shortly following his decision to enter actively into the field as a manufacturer, a franchise was secured at Painesville, Ohio, the city where the North apparatus was first employed.

* * *

Presuming that this story is true in its essentials, the North enterprise was fostered, albeit, unwittingly—by the Bell!

* * *

The foregoing is pertinent in the light of more recent events. A little more than two years ago, the trade was somewhat startled when it learned that the North Company had granted the Western Electric Company a non-exclusive license to manufacture and sell automanual apparatus, but the real shock followed in July, 1912 when the announcement came that the North Company would abandon the manual field and devote its energies to the promotion of automanual exclusively. The present embarrassment must be due to a short-sighted policy. The North Company trade mark—the one we have known since the advent of automanual is symbolical of the present tragedy—between two receivers. We have shown that the Bell paid the costs that made North possible at the start and how the same concern, under the licensing agreement, provided funds for perpetuating the North

enterprise. Is it within the range of possibilities to have the Bell step in again and lend a helping hand?

* * *

Nathan Corning Kingsbury, vice-president of the A. T. & T. Company and author of the famous letter which outlines his concern's present attitude with respect to competitive telephony, acknowledges that he is complying with certain requirements of the Department of Justice. No better argument was ever chronicled in favor of renewed activity on the part of independent operators. Mr. Kingsbury voices the sentiment of his company when he says he is ready to deal equitably with independent operators. With the knowledge that he is spurred into this arrangement at the suggestion of our highest tribunal, the independents have time to carefully digest the proposals that have been made. If the contractural relations are to be fair, the independents have a very large voice in the matter. Mr. Kingsbury is a vigorous, active type who is high in the councils of his company and a director in the Harris Trust & Savings Bank of Chicago.

* * *

Among the big things that has grown out of the Kingsbury proposal is the termination of the government's suit against the Pacific T. & T. Company. Attorney-General James B. McReynolds has asked the approval of the federal court for a decree of consent to adjust the litigation with the Bell and independent interests out of court. It is believed that this will pave the way for a consolidation of the competing plants at Spokane, but that the contemplated merger of all the plants in the northwest will be dissolved.

* * *

TELEPHONE ENGINEER has contributed many beautiful thoughts on the subject of telephone courtesy and it has ever maintained that the switchboard operators never merited one-tenth of the abuse that befalls them. In an unguarded moment, a short time ago, Henry M. Hyde became curious respecting the intricacies of metropolitan telephone system and waded into the subject. Mr. Hyde is a special staff writer for the Chicago *Tribune*. Among the disclosures brought forth by Mr. Hyde, none were more startling than that the Chicago telephone service was ninety-six per cent pure, or perfect. In our wildest extravagance we have never given the girls credit for such performance. Those of us who buy service from the Chicago Telephone Company will not agree with the Hill-Hyde estimate. Should we see the statement on the pearly pages of St. Peter's records we would still have our doubts. Thousands and tens of thousands of us know better—not from the experience of yesterday but of today.

* * *

As recently as twenty-three minutes of four o'clock on the afternoon of Saturday, March 28, I called Normal 1209, a station situated two blocks due west from my residence telephone, Wentworth 2326. Mine is a direct line—the called number, party line, but the connection was promptly made. For twelve minutes following my call, the merry tune of automatic ringing was continued in my ear. I then signaled the operator who asked, "Number, please?" I told her to connect me with somebody in the office who would stand for a little plain and unadulterated profanity, preferably a male. She lodged me against the wrong party—a man who refused to listen to my fusilade. I told him dispassionately the very recent experience I had had; asked whether he thought it was illustrative of modern telephone operation, or an example of straight bunk; and would he tell me what time limit governed the ringing of a called subscriber before one should be told that the party did not answer. This uncivil cuss came back with the answer that there was no rule bearing on the point, and I then asked him if he wanted his answer to be taken seriously. He assured me there was no rule. Plain decency precludes the exact phraseology of my reply, but his courtesy rule somewhere toward the finish of my tirade suggested hanging up his receiver. Nothing in this world offers greater insult than to retire under fire by such a cowardly performance. Hanging up a receiver is worse than a slap in the face. I went back after the man, but encountered another who told me in reply to my query that he was acting city traffic manager for that particular afternoon. He also informed me that the time limit for ringing a called subscriber was one and a half minutes—that all operators knew the rule—that it was part of the code. He also agreed with me that twelve minutes was not approaching good practice; that it was unfair to the calling subscriber whose line was tied up and in my particular case it was also bad form to take the time of any or all on the called party line for the same length of time.

* * *

Every man in Chicago can recite similar cases for every day in the year—all of which goes to emphasize the fact that the Chicago service lacks some of the elements that make for perfection.

* * *

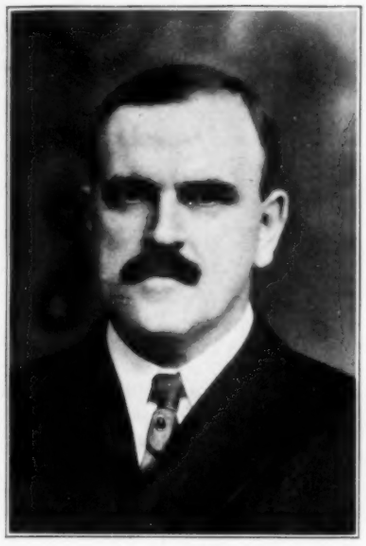
Speaking close to home, TELEPHONE ENGINEER managed to get along with Chicago Tel.'s class M service—measured—until last November, when of a sudden our service bills were doubled. Excess calls grew from nil to nearly ten a day. This Bell service has been augmented by automatic, over which we have always originated as many calls as that system affords. There was nothing we could account for that would have a tendency to double our Bell calls. Our frequent protests disclosed the fact that the Chicago Telephone Company has been furnishing the service from Harrison district exchange at a loss approximating 10 per cent for many years. And some of us doubt that the Bell company isn't philanthropic! The secret of the change in my rate is due to the installation of an automatic register. With the careful supervision of nearly two million calls a day, this little register is never in error! All operating companies who desire to increase their revenues 100 per cent at minimum cost are urged to buy these meters. The telephone business—always a winner in the face of such prior waste in operation—now becomes a positive whirlwind of lucrativeness.

Lincoln Stock Proffered to Bell

Upward of $1,500,000 worth of stock of the Lincoln Telephone and Telegraph Company will be proffered the Nebraska (Bell) Telephone Company within a short time under the agreement entered into when the gigantic merger was effected in that state.

At the same moment, unless unexpected turns occur between now and then, the proffer will be waived aside and the Lincoln Telephone and Telegraph stockholders will be free to go their way and the Bell interests will stand charged with a violation of the spirit and almost the letter of their agreement. They are prevented from acquiring the stock by an order of Attorney-General McReynolds of the United States.

President Woods of the Lincoln company is now sending letters to stockholders asking for stock assignments to the officials of that company. When they are collected the proffer will be made to the Bell interests.



T. P. Sylvan

Government vs. Private Ownership

Address Before the Richmond Telephone Society

By T. P. SYLVAN

BECAUSE of the present agitation the subject of government ownership of the telephone and telegraph system, as against private ownership, is now very important, and as good citizens of this country of ours, you are all deeply interested in it. From my contact with the telephone fraternity, I am sure that no industry has a more loyal and faithful lot of citizens, and as citizens we are deeply interested in the correct solution of this momentous question. We must, therefore, approach the subject carefully and with the single purpose of endeavoring to determine what is best for our country, rather than from any purely selfish motive.

As I view the subject, it naturally divides itself into three parts:

First—The capacity and ability of the government, represented by its Postoffice Department, to handle the telephone business of the country properly.

Second—The capacity and ability of the privately owned corporations to handle the telephone business of the country properly.

Third—The effect of a change in ownership and control on the business interests of the country.

I shall consider this subject under these three headings, and naturally shall have to consider the experience in this country and abroad with reference to each of the subjects above mentioned.

* * *

First—The capacity and ability of the government, represented by its Postoffice Department, to handle the telephone business of the country properly.

The advocates of government ownership of the telephone and telegraph constantly point to the efficiency of the postoffice department as exemplified by its handling of the mails. I do not like to use the term dishonesty, but from my way of viewing this subject I cannot reconcile the repeated statements which have been made by various advocates of government ownership with truth; when it is considered that the public press and official reports of government agents are full of statements calling attention to the fact that the postoffice department of our government is being so conducted, as far as accounting is concerned, that it is impossible to determine its relative efficiency or the entire cost of handling the mails of the country.

Congressman Lewis and others have presented for public consideration elaborate tables purporting to show the efficiency of the postoffice department measured in certain units and compared with private industries and foreign governments. How Mr. Lewis can do so, in the face of statements like the following is beyond reasonable comprehension. Mr. Henry A. Castle, then auditor of the United States Postoffice Department, in an article published in the *North American Review* in 1902, stated as follows:

> As now managed the postoffice department has no plant whatever. All it owns in the way of personal property is mail bags, mail locks, letter boxes, carriers' bags and a few similar inconsequential items. Even in public buildings it is the tenant of the treasury department.
>
> Here is disclosed a very large expenditure which never figures in computing a postal surplus or deficit. In all cities the United States owns imposing structures, where the local postoffice and all other branches of the department have their capacious and luxurious homes without cost to the postal revenues. No rentals are ever collected or computed. More than this, all expenditures for heating, lighting, repairs, janitor service and supplies, are paid for from other appropriations. The aggregate of all these items including a fair rental for quarters occupied would amount to several millions of dollars annually.
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> * * *
>
> In addition to this should be mentioned the cost of the postoffice department at Washington, and of the auditor's office, embracing salaries of more than a thousand officials and employes, which are paid from appropriations for what is termed legislative, executive and judicial service, and never appear in postal estimates, amounts or balances.

Under an act of Congress, approved March 2, 1907, there was appointed a joint commission to investigate and report on the business method of the postoffice department and the postal service. Such commission consisted of Senators Boies, Penrose, Thomas H. Carter, A. S. Clay and Representatives Jesse Overstreet, J. J. Gardner and John A. Moon. Hon. John A. Moon has for many years been, and is now, the chairman of postoffices and post roads of the House of Representatives.

In making a preliminary report to the Senate and House of Representatives, the commission had this to say:

> It appears too obvious to require argument that the most efficient service can never be expected as long as the direction of the business is, as at present, intrusted to a postmaster-general and certain assistants selected without special reference to experience and qualifications and subject to frequent change. Before the postmaster-general and his assistants can become reasonably familiar with the operations of the service they are replaced by others, who, in turn, are called upon to resign before they can, in the nature of things, become qualified by knowledge and experience to perform their allotted tasks. Under such a system a large railroad commercial or industrial business would inevitably go into bankruptcy, and the postoffice department has averted that fate only because the United States treasury has been available to meet deficiencies.

This commission engaged the firms of Jones, Caesar, Dickinson, Wilmot & Co., and Deloitte, Plender, Griffiths & Co., both of New York, to assist in investigating and reporting upon the conditions existing in the service. In a joint report made by both these auditing firms to the special commission appear the following statements:

> The general accounting methods in force throughout the department and service have received a large share of our consideration, in view of the fact already noted that this has appeared to us to be the main and primary purpose of our appointment. The general absence of any efficient methods of accounting has been brought to light by the inquiry carried out by the joint commission on second-class mail matter. This report was referred to Congress January 30, 1907, and our investigation has confirmed the impression gathered from a study of it that the whole of these methods are crude in the extreme

and such as no private business concern or corporation could follow without the certainty of loss, if not of financial disaster. * * *

Closely allied with the accounting is the proper audit of postoffice accounts. We have been impressed at the various stages of our inquiries by the anomalous position of the auditor for the postoffice department as compared with that held by the other treasury auditors, and we are satisfied that drastic changes in the present methods and organization, and also in the laws governing the office of the auditor for the postoffice department, must be made if an effective and, at the same time, economical check upon the financial operations of the service is to be obtained.

In the course of our investigation into the main subjects referred to we have necessarily had occasion to observe the general methods of administration throughout the department and service, and have been particularly impressed with the divergences therein in different bureaus, divisions and sections in handling transactions of a similar character, and we shall show in this report how, under the present system of administration, these appear to have grown up over a long period of years without any very definite plan. There exists an independence and lack of co-operation not only between different bureaus and different divisions, but even between different sections of the same division, and in identical field operations, which must undoubtedly do much to hamper the service and increase its cost.

Owing to the mass of minute details involved in the study of such questions, we are able at the present time only to call attention to the most glaring cases, and to point out how progress may be made toward that unification of methods which is absolutely necessary for the economical administration of any business institution.

Such accountants expressly call attention to the fact that the expenses of the auditor for the postoffice department are borne entirely by the treasury department. They urge that, for the purpose of ascertaining whether the service is being conducted at a loss or profit, it would seem essential that in future the whole of these expenses incident to audits should be taken into account.

Similar attention is called to the fact that amounts due to certain branches of the Southern Pacific and Union Pacific Railroad companies for transportation of mails are not paid to such companies under instructions from the secretary of the treasury, being retained by him in part payment of debts due by those companies to the government. They comment on the fact that such an arrangement does not appear as a good reason for excluding such payments from the expenses of the postal service. They also comment on the fact that during the year under consideration $350,000 was appropriated to pay the government printing office for stationery, printing and supplies, such amount not being considered as an expense of the post office department. The salary and expenses of the assistant attorney-general delegated to attend to matters pertaining to the postoffice service is not charged to the postoffice expense, but is carried as a department of justice charge.

With reference to the space occupied by the postal service in government buildings, the accountants state that no accurate figures nor reliable estimates are obtainable. It may be interesting to know that while it is impossible to determine whether or not the following figures include all items of expense, the annual report of the supervising architect of the treasury department for the year 1912 discloses the fact that there have been expended under the various heads indicated amounts as follows:

In this list of public buildings there are 583 which are exclusively postoffices and 287 which are used jointly as postoffices and courthouses, custom houses, etc. The following table shows the expenditures under the various heads for these two classes of buildings:

POSTOFFICES ALONE.	
Repairs, etc.	$ 118,746.91
Mechanical equipment	52,801.23
Vaults, etc.	59,981.55
General expenses	583,865.56
Furniture, etc.	374,872.89
Total	$1,190,268.14

POSTOFFICES, CUSTOM HOUSES, ETC.	
Repairs, etc.	$ 305,409.08
Mechanical equipment	335,787.20
Vaults, etc.	32,999.61
General expenses	184,438.89
Furniture, etc.	417,349.28
Total	$1,275,984.06

It is reasonably certain that such statement does not include all expenses, because in various appropriations there have been large sums expended for fuel, light and water for public buildings, amounting to nearly $1,500,000, and also for pay of assistant custodians and janitors, amounting to $2,500,000.

In this connection, you will no doubt be interested to know that in the postoffice and custom-house buildings at Richmond, Va., the amount expended during the fiscal year ending June 30, 1912, under itemized appropriations was more than $3,000,000; such amount does not include, however, the amounts expended under general appropriations, such as for salaries of janitors and assistant custodians, fuel, light, etc. As bearing out the comments of the accountants in their report to the commission, it is impossible to determine just what amount has been expended for fuel and such general items in Richmond or any other given city. As indicating the importance of considering this question of cost of space, in a part of the report of such supervising architect devoted to the construction account, so far as buildings are concerned, we find that more than $1,000,000 has been expended for construction and maintenance of government-owned buildings in Richmond, while to June 30, 1912, $74,000 has been paid out in rent for temporary quarters. In addition to such amount, approximately $250,000 is shown as having been expended for sites, none of which items are charged to the postoffice department.

Similar figures for the entire state of Virginia would show approximately $5,000,000 as representing the amount affecting the postoffice department not in any way charged to such department.

The firm of accountants in the report hereinbefore mentioned makes the following statement with reference to the appointment of postmasters:

The appointments of postmasters are, as a rule, entirely political, those of the first, second and third class being made by the president by and with the advice and consent of the Senate, and those of the fourth class by the postmaster-general.

With reference to the bookkeeping method of the postoffice department, the accountants report as follows:

The books are kept on a single entry basis on the most antiquated lines; debits are made at one time and from one source and the corresponding credits at another time and from another source. Many of the subsidiary books which form part of the bookkeeping system are not even added; and owing to the lack of proper system of balancing by totals and other deficiencies, irregularities could be practiced indefinitely without the fact becoming apparent from the general books.

* * * * * * * *

There is practically no agreement whatever between the revenues and expenditures as shown by the general books and the actual cash received and disbursed in any year as shown by the records kept in the division of finance.

As further indicating the difficulties incident to the operation of the postoffice department, it is interesting

to note the statement made by such accountants in connection with making payments:

Every request, of even the smallest postoffice, for allowances for any purpose whatever has to be made to the headquarters at Washington. Allowances are in a large number of cases for amounts less than $1, and it would seem that if there were a district superintendent in the field who could pass on such matters it would save a large amount of routine work and consequent expense in the department at Washington. From the fact that it has to deal with nearly 65,000 postmasters scattered over a vast area of territory, it cannot be in a position to determine intelligently or efficiently upon the needs of each.

The bureau chiefs appear to spend an increasing amount of their time in the mere routine work of signing formal documents and passing upon requests of various kinds for allowances, or otherwise, which could be intrusted to properly qualified officials in the field without detriment to the postal service. This point recurs at every stage of the inquiry, and appears to call for some radical change in administrative methods if, by the continual growth of the postal business, the department is not either to lose control over the service or to exercise this control in such a perfunctory manner as to make it practically useless.

With reference to the method of apparently avoiding errors, the following statement is made:

The only safeguard recognized throughout the finance and accounting divisions of the department appears to be that of duplication. If one duplication does not result in reducing or preventing errors, then another entirely fresh set of records is prepared and an entirely different set of clerks are put on to do the whole work over again from the beginning. This duplication undoubtedly arises partly from the inefficiency of many clerks in particular divisions, but is mainly due to the want of any proper accounting system under which checks by totals can be made to take the place of laborious and unnecessary checks by duplication which at present exist.

As indicating the amount of red tape used, it is interesting to note the comments of the accountants with reference to purchasing of supplies. When calling attention to large sums of money which the postmaster is permitted to retain, in many instances amounting to hundreds of thousands of dollars, they go on to say:

The department is quite contented to trust them with all the above-mentioned receipts, but does not trust them to spend fifteen cents for a rubber stamp without going through the whole routine of obtaining an authorization from the department. This is a fair sample of the excessive centralization in Washington which must seriously affect the efficiency of the service, and as the business and the number of postmasters increase, it must have a still more damaging effect.

As indicating the apparent stagnation so far as improvement in postoffice operation is concerned, the accountants call attention to a report of Postmaster-General Howe, dated November 18, 1882, with reference to salaries and allowances, which at that time amounted to only a small fraction of what they are today. Calling attention to the fact of conditions as they were at that time, the accountants, when commenting upon such fact, say:

There is still no standard by which the economical administration of a postoffice can be gauged. Appointments of postmasters are still made almost entirely for political reasons and not by reason of the applicant's ability or knowledge of the workings of the postal service. The criticisms made on the compensation of third and fourth class postmasters still apply to those of the fourth class. This report, reread after a lapse of twenty-five years, gives a striking illustration of the stagnation that has pervaded the whole administration and perpetuated defects which, even at that time, were so glaring as to need the strong condemnation meted out to it by the then postmaster-general.

After calling particular attention to the difficulties in connection with obtaining appropriations from Congress for handling the department during the ensuing fiscal year, the accountants call especial attention to certain points as indicating the result of this difficulty. For example, with reference to the use of labor-saving devices and machines, they state the following:

There is a lamentable lack of labor-saving devices practically throughout the whole department and service. Even for such an elementary machine as a typewriter we are informed that there are hundreds of applications on file which the department has been quite unable to fill. Of the more valuable machines, such as arithmometers, book typewriters and calculating machines, there are few in use, and even in the field postoffices such scales as are provided for the special weighing of mails now in progress are of a very inferior grade, and from the information we have gathered it would appear that with few exceptions there are no mechanical conveying devices in any suffice for expeditiously handling and weighing the mails.

To accomplish the result which your commission desires, namely, the installation of a system under which the cost of service may be ascertained, it is absolutely essential that mechanical devices of all kinds be freely adopted, and there can be little or no doubt that such supplies intelligently distributed and used will in the long run increase efficiency, decrease cost and probably increase the revenue of the postal service.

As indicating the absence of standardization, it is interesting to note the comments of the accountants with reference to filing:

Under the present organization each separate division appears to have its own filing system, and the filing is conducted in no uniform method, but according to the particular ideas of the officials in charge thereof. The rules as to the length of time for which files must be preserved vary in each division. In some cases it is determined by Congress, in others by order of the postmaster-general, and in still others by the division chiefs.

With reference to securing data from which reports may be made, the accountants comment as follows:

Laxity on the part of postmasters is further exemplified by the tardiness in receiving reports of the weights of mails originating at postoffices, called for by act of Congress approved March 2, 1907.

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Apparently the postmaster-general is clothed with sufficient power to enable him to discipline or remove postmasters who are indifferent to their duties, and there appears to be no good reason why the department should be so lenient. Apart from the resulting lack of discipline the work of the department is seriously embarrassed, and the recording of accounting figures and the preparation of correct statistics is retarded.

Anyone who is interested in this subject will find the complete report of the accountants made to the special commission extremely interesting and full of excellent material as indicating the terrible state of affairs pervading the postoffice department. Unfortunately, for reasons which I will hereinafter discuss, no substantial good has come from this, or any other, effort to reform and improve the service. You are all familiar with the efforts which Postmaster-General Hitchcock put forth after the special work had been done, particularly with a view to increasing the income of the government by a reclassification of certain schedules. Mr. Hitchcock courageously advanced his theories, but was met with an avalanche of criticism. The prominent papers and publications of the country took up an active fight to prevent any change in the rate of postage on second-class matter, claiming, as they easily could, that the department should first reform its administrative side before asking the country to pay more for service. You will perhaps remember that Mr. Hitchcock, in an effort to make a creditable showing, concluded to send a great deal of second-class matter by means of fast freight in place of mail service, so that magazines on the Pacific coast and other distant quarters were to some extent delayed in their delivery. Just about the time that Mr. Hitchcock began to appreciate the need and desirability of reform in his department, political change ended his career, and, as evidencing the amount of credit which Mr. Hitchcock obtained from his effort at economy, you

will be interested to hear what the present postmaster-general, Albert S. Burleson, had to say with reference to the claimed elimination of the postoffice deficit by Mr. Hitchcock:

"The all-absorbing program of the last administration was the placing of the postoffice department on a paying basis," says the report. "The policies pursued in the effort to succeed at this plan were overworked and resulted in defective administration and just criticism on the part of the public.

"That efficiency and economy should be substituted for wastefulness and extravagance needs no argument, but the postal service affects so vitally the interests of the entire population of the country that economy which means a curtailment of postal facilities operates as a check to the social and industrial progress of the country. The people are entitled to the best facilities administered in the most efficient manner. That the facilities furnished during the last four years were not the best is clearly established by the facts."

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"It is to be further noticed that the balance sheet as heretofore prepared concerned itself entirely with the revenues from postage and the operations of the department and expenditures under the appropriation for the service of the postoffice department. In addition to this the department should be able to make a complete statement of its financial status, which should include the administrative expenses of the department, the expenses of the auditor's office, and a fair charge for the maintenance of federal buildings used exclusively or in part for postoffice purposes as items of cost. It has not been the custom to include these in the balance sheet. Furthermore, due credit should be given the department for the service performed in handling and carrying franked and penalty mails.

"In line with the policy of unwise administrative economy which the former administration had adopted, vacancies in the clerical force of the department were permitted to remain unfilled and the lapsed salaries were turned back to the treasury. The withholding of deserved promotion caused dissatisfaction among the employes and undoubtedly to some extent lowered their efficiency and contributed against keeping current the work of the department."

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"The records show that during the four years from March 4, 1909, to March 4, 1913, vacancies which were allowed to exist for periods of from one month to more than one year aggregated the equivalent of thirty-four clerks employed continuously during the above period."

The committee asserts that immediately before the time when the new administration was to take office there was a "complete reversal of policy, and that all available places in the department that had remained vacant for months were filled." "On January 21, 1913," says the report, "urgent verbal instructions were given by the postmaster-general to report for immediate final action every possible favorably approved rural route, and, acting under these instructions, over one hundred rural mail delivery establishments were authorized in three days. Directions were given to expedite as much as possible inspectors' reports on all cases then under investigation of rural delivery routes and of allowances."

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"During the early part of the administration," the committee says, "action was deferred on all cases involving the establishment of city delivery service in which there might be any excuse for delaying action, notwithstanding that the people were entitled to the service, and that its establishment had been recommended by postoffice inspectors. Many such cases were acted upon only after persistent requests of senators and representatives."

We thus note that efficiency claimed by one postmaster-general is disclaimed by his successor.

As showing the difficulty concerning government appropriations, I wish to call your attention to the recent action of the House Military Committee, as reported in the newspaper dispatches under date of February 16.

The committee reduced the amount which Secretary Garrison had indicated as necessary for the proper maintenance and improvement of the army by nearly $11,000,000. As a result of scaling down the appropriation, it will take fourteen years to obtain additional artillery, which the secretary was desirous of providing during the next seven years.

Regardless of whether the secretary of war, with his knowledge of the needs of the army, is right or the committee, with its knowledge of the ability of the country to provide funds, is right, the fact nevertheless remains that there is a divided responsibility and a consequent delay which may, should we have any need for the military arm of the government, prove serious. We know, however, positively, that such a great difference of time in the delivery of important telephone equipment would be most disastrous.

As a further indication of the criticism of the postoffice service, it is interesting to note the comments made by Don C. Seitz, a great student of the economic subject, and connected with one of the great dailies of the country. In a rather lengthy article in the *World's Work* in 1911, Mr. Seitz makes the perfectly reasonable claim that the postoffice department represents the only corporation that does $224,000,000 worth of business in one year and yet loses money. He calls it a "department that has 'gone to seed.'" In his article he calls attention to the wonderful advantages which the government enjoys in that it practically exacts service without payment from so many people in the sale of its stamps and other accommodations, and yet, with all of this, it must show a large deficit, even considering the fact that it pays no interest upon its investment, makes no provision for the payment of rents of quarters occupied, and a great many other items of expense.

In an article in the New York *World*, under date of January 28, 1912, W. D. Brown, formerly an auditor in the war department, shows that the postmaster-general has not wiped out the deficit, but, on the contrary, there now is a deficit of at least $7,000,000. Mr. Brown says the postmaster-general has been enabled to seemingly wipe out this deficit by increased revenues, juggling of figures and a failure to pay bills when due.

In connection with attempts to explain deficits, many of the advocates of government ownership point to the enormous amount of franking now done by the postoffice department, and in an item appearing in the New York *Times*, under date of November 21, 1912, the statement was made that more than $3,000,000 of the postal expense was due to political matter being handled through the mails. Unfortunately for the benefit of the country generally, this attempt of explaining away a part of the deficit does not really take care of the deficit and it would be interesting to speculate upon what the results would be were the telephone and telegraph to be taken over by the government. It is impossible to conceive that, in the event of the government taking over telephones and telegraphs, these convenient agencies would not be used for transmitting intelligence for claimed governmental and political processes; and the query arises, would the business man and farmer be satisfied when a large deficit was to be accounted for to have the explanation made that much of the expense incident to operating the telephone and telegraph branch of the postoffice represented the cost of furnishing franked service to the government and its officials? You telephone men know from the constant efforts made by municipal authorities to get so-called free service, what we might expect if the government controlled this matter.

As bearing out the proposition of the present inefficiency of the postoffice department, it is interesting to note what Thomas L. James, in an interview with the Boston *Herald*, under date of August 23, 1910, had to

say. Mr. James stated that his experience as postmaster-general, and also as postmaster of New York, which is the great clearing house of the postoffices of the United States, had satisfied him that any corporation managed as the best of the telegraph or telephone corporations are, or as the most successful of the express companies are managed, would be able to operate the postoffice department at so great a saving that, after a few years, it would be possible to reduce the price of letter postage to one cent an ounce. But, in Mr. James' opinion, this cannot be done under governmental administration until the postoffices of the United States cease to be regarded as primary opportunities for political patronage for the majority party.

As indicating the general tendency toward inefficiency where politcal control is the dominating motive, it is interesting to note the comments made by Dr. Frederick A. Cleveland, chairman of the President's Commission on Economy and Efficiency, as they appear in an article in the *American Review of Reviews,* issue of April, 1912. In a somewhat lengthy discourse, Mr. Cleveland calls attention to the fact that the fundamental difficulty is that Congress does not have ample information upon which to base intelligent action and that conquently there is great waste. There is further a loss due to bad organization, inefficient personnel, failure to provide for adequate equipment, ineffective use made of equipment provided and bad methods employed; also a great loss in contracting and purchasing and lack of central direction and control.

Volumes on newspaper comment and comments of prominent men might be cited as supporting the foregoing statements, but I will not take the time to do so.

Another very important factor which must be considered before determining whether or not the government is really efficient in handling its postoffice business is the question of payment to the railways for the service performed by them. There is, of course, a great difference of opinion as to just what, if any, amount there is due to the railroads, but quoting from the *Bureau of Railway News and Statistics,* issue of December 2, 1912, I call your attention to the fact that the railroads of the country claim that $25,000,000 per year is extorted by the government from the railroads. No matter what the amount, if any, it should be paid to the railroads. Such a determination should be made before the government claims any net return from the operation of the mail.

In determining the efficiency of the government, we should also consider the manner in which the government treats the retail stores of the country, notably the drug stores, in the matter of the sale of postage stamps without compensation to the storekeeper. Advocates of government ownership, when confronted with this statement, explain that there is no obligation on the part of the retail storekeeper to sell postage stamps. While this may be technically true, the very fact that the government does not make adequate provision for the sale of its stamps forces, as a matter of necessity, the action of the druggist and other retail men in selling stamps without any profit. Is it not possible that the government would assume this same attitude with reference to the public pay station telephones located in drug stores and other retail establishments? The government might well make the same claim that the druggist is not compelled to furnish pay-station facilities or to contract for them, and that no commission or compensation should be allowed by the government. The resultant saving from not paying such a commission might justly be claimed as an added example of government efficiency.

All of the foregoing comments apply to the relatively simple problem of handling the mail service of the country. I say relatively simple when compared with the telephone and telegraph service of the country. As an example of the relative simplicity of the services compared, you no doubt all have had occasion to consult the small cards indicating the postal rates on various kinds of mail matter. The entire schedules may ordinarily be printed on the back of a visiting card, and, as a matter of fact, are printed on the back of the small stampbooks which are sold. Contrast this, if you will, with the intricate and voluminous rate schedules necessary in connection with the telephone and telegraph business. We all appreciate that rate-making forms one of the most serious problems in connection with this service, and if all the difficulties incurred in the postoffice department have arisen in connection with the simpler mail service, what might be expected in connection with the more intricate telephone and telegraph schedule?

Again, contrast if you will, the work and equipment of the mail service with that of the telephone service. The gradual extension of the mail service may require additional carriers, additional cars and additional space in rented or old quarters. Under the heading *(Second)* "The Capacity and Ability of the Privately Owned Corporations to Handle the Telephone Business of the Country Properly," I will try to indicate the difference when it comes to the growth of the telephone business.

The query might rise as to whether or not, as a result of the many investigations, reports and recommendations which have been mentioned, any considerable improvement or change may have been effected in the postal practice and service. Reference to the *Congressional Record* shows that no change or improvement has been effected. Mr. Fitzgerald of New York, in the *Congressional Record,* representing the proceedings on January 20, 1914, makes the following statement:

> Under Republican administrations it had been the custom for some years to appoint the chairman of the national Republican committee postmaster-general, so that there might be no mistake as to the partisan character of the men appointed as postmasters in the first and second class postoffices in the country. The abuse became so great under Postmaster-General Hitchcock and Postmaster-General Cortelyou that President Taft, a Republican president, was compelled to cry out against the existing condition and to admit that these partisans not only did not give their time to the public service for which they were paid, but that evidently he was helpless to compel them to do so.
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> The so-called economy and efficiency commission to which the gentleman from Iowa refers and for which perhaps he has more respect than I have spent $260,000 in its work. I have challenged from time to time anyone to point to a single original recommendation which that commission has made which has resulted in the saving of a single dollar to the United States.

As further indicating the fate which ordinarily befalls reports and recommendations having for their object improvement in service, I call your attention to a statement made by George French, author and editor, in a letter to the New York *Times,* dated October 10, 1913. Mr. French, during the administration of Roosevelt, had been commissioned to examine the government printing office, as an expert in printing and economics. In calling attention to the results of his report, he makes the following statement:

> I never got beyond a preliminary report, after about three weeks' work. The work was never finished. The expendi-

tures committee faded away when a new Congress came in, and there was nothing at all left as evidence that it had existed, except some incomplete and generally irrelevant papers somewhere in dusty pigeonholes and sundry entries on the ledger of the disbursing clerk of the Senate. My report was among those dust-gathering papers. I doubt if any member of the committee ever read it. It was wholly abortive. My work was entirely useless. The money paid was absolutely wasted. All the money paid for the work and expenses of the committee was wasted. The committee accomplished nothing, and I have often doubted if it ever intended or wished to accomplish anything. It is against the Washington idea to do anything to check expenditures. Yet I was able to show that at least $1,500,000 a year could be saved in the operation of the government printing office without disturbing the condition of the workers as to their pay or privileges.

In calling attention to the omission of the various items which every thinking man will agree should be considered as a part of the expense incident to conducting postal affairs, I do not want to be considered as criticising the payment of such expense from other appropriations. If the Congress of the United States, representing the people, desire to maintain the postoffice department at a loss, so far as the revenue from the postal operations is concerned, that is entirely a matter within their power and right, but what I do maintain is that it is unfair, if not dishonest, to ignore all of this expense in comparing and determining the relative efficiency of the postal employes when compared with employes of privately operated industries.

I do not wish to be understood as criticising the personnel of the postal department. They, no doubt, have many excellent ideas for reform and improvement, but, in an organization such as theirs, it becomes impossible to do anything but float with the tide. Rather than criticise such employes, I am sure all of us will sympathize with them, for what can be more terrible than for a man with ambition, strength and a desire to serve well, to be compelled to go along with the mass, thankful alone that he is permitted to draw his pay?

I wish to say to the credit of the government employes, every one with whom I have come in contact—and there have been many—has expressed himself as opposed to government ownership of public utilities and has cited his own unfortunate condition as the best argument against the same.

In connection with considering the question as to whether or not the government-owned service will be self-supporting, consideration must be had of the taxes which are now being paid by the privately owned telephones and telegraphs of the country. From the best figures available, such taxes amount to approximately $20,000,000 per annum. The moment that the telephone and telegraph users of the country, through the privately owned companies, cease paying this amount for the support of the government—municipal, state and national—this $20,000,000 will have to be raised in a different manner. Unless the government-owned telephone and telegraph system in connection with the postoffice system would produce profit or net balance, every extension of service, increase in pay of employes, or the adoption by the postal department of a pension and disability plan would necessitate increased taxes or government indebtedness. With the rivalry existing between political parties, increased taxation or public debt would be bitterly resisted. Evidence of this is disclosed by the fact that while the privately-owned companies, notably the telephone and telegraph, steel and railroad industries of the country, have all adopted liberal pension and disability plans, the government has, as yet, not seen fit to adopt anything for the relief of the postoffice employes. As evidencing the neglect of the government in this particular, I would like to call your attention to a statement made by Mr. Reilly, which appears in the *Congressional Record* for January 16, 1914:

* * * It was not until I became a member of this body that I learned that old wornout letter carriers and other superannuated employes of the government were not retired on part pay, but, on the contrary, were dismissed from the service when they could no longer keep up the pace. One of the first letters I received after being elected a member of Congress was from an old postal employe, who had received an official notice from his postmaster informing him that he had been off duty the allotted number of days in the year allowed by the department and that his resignation would be accepted. The simple statement of that heart-broken man asking me to assist in having him kept on the rolls made my heart ache. He had spent thirty-four years of his life pounding the pavements in all kinds of weather and at all hours of the day and night, and was known and loved by the citizens of the community he served, composed of all classes and creeds and political affiliations. He had not only given the best years of life to the government in building up the postal service, but was at an age and in such a condition that he could not hope to find employment of any kind. He was in such financial straits that if thrown on the world he would have to depend on the bounty of relatives or friends or else become a public charge.

What a cruel, cruel fate to leave a man to who had lived an honorable, upright life and was a model citizen! Why, Mr. Chairman, if this man had worked for a railroad company or a banking institution or a large corporation of any kind and was treated in such a manner, it would be the subject of public condemnation. But being a life-long employe of the government no one seems to take more than a passing interest in him. We legislate here to curb the trusts and the railroads and corporation and denounce them as soulless, but I believe it would be well for us to reflect and take a few leaves from the book of rules which govern them in their treatment of their employes.

In the same *Congressional Record* appears the statement of Congressman Griffin:

* * * It has been stated that the personnel of the postal service changes every seven years, and this will give an idea of the small percentage of those who do make it their life work. And now, Mr. Chairman, what is the reward of these men and women who give the best years of their lives to the public service? Well, it is hard for me to say it, because I detest ingratitude, governmental or otherwise, these employes are forced to resign when they become superannuated, unceremoniously kicked out, and told that they are inefficient and can no longer do the work required of them—outlived their usefulness. It is one of the saddest incidents of our governmental life. Thrown out with the flotsam and jetsam of humanity who have no aim or object in life, because of years of ardent labor which have used up their energy and vitality. Yes, Mr. Chairman, like an obsolete piece of machinery or a broken piston rod, they are thrown on the scrap heap.

It may be assumed by some that the postal service has not the hazards of other corporations and the employes are, therefore, not subject to the accidents which occur in privately-owned enterprises. When we think of the many railway accidents in which postal clerks have been injured and also consider the report from Mr. Rubinow, which appears in the *Survey*, in which he states that there were 1,600 injuries to employes of the postal service, 390 of them fatal; there were 17 fatalities and 124 injuries in the rural mail district and 8 fatalities and 440 injuries in the city mail delivery, and that in none of such cases was any compensation paid by the government, we must appreciate that the mail service exacts its toll of injured and killed as well as the privately-owned corporations.

As indicating the resistance of the parties in power to the expenditure of money for extensions or increases in cost, we have but to look abroad for experience. During a debate on the Appropriation bill, before the House

of Commons in Great Britain, on Wednesday, August 16, 1911, in reply to one of the members who urged on behalf of his constituents an extension of telegraph service in his district, Herbert Samuel, the British postmaster-general, made the following statement in connection with his reply:

* * * that there was no cause for charging the general taxpayers of the country with this particular extension. I am afraid, in view of the action taken by the treasury I cannot favor the telegraph being extended to that place.

In examining the various bodies in Congress and in other public bodies, one will find that usually the minority party will be profuse in its arguments for the improvement of the condition of the employe and extension of business, while the majority party in power will be found to resist, knowing full well that most of the people in subsequent election will have lost sight of the particular reason for the increased taxation of indebtedness, with the result that such increased taxation or debt will usually be a ground for change in party.

Looking at the reverse side of this picture, we find that experience abroad has been in line with that of this country, in that there is a constant effort on behalf of everyone to have the cost of service reduced. This was very forcibly evidenced in the recent reduction in parcel post rates in this country and the constant efforts in reducing telegraph and telephone rates in foreign countries. The statement is usually made by the persons desiring such reductions that the reduced price will bring sufficient increased business to make up any loss. In all of such cases but a feeble resistance can be made beacuse there is no one with sufficient personal interest in the matter to court the abuse and condemnation which usually follows an effort to resist such reductions.

As an interesting result of this condition, I call your attention to an editorial in the Winnipeg (Man.) *Free Press* of June 15, 1912:

Last fall the enterprise had got in such plight that rate increases were deemed necessary, and the commission made the announcement of a new schedule. The *Free Press* at once began its campaign against the announced rate increases.

It is not necessary to refer to the extraordinary and sustained manifestation of public indignation that followed upon the announcement of the telephone rate increases and the necessary disclosures which that announcement involved, that the annual financial statements made by the government in the legislature had not been the truth.

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The public indignation which greeted the announcement of the proposed rate increases last fall was at first resisted by the government. The Winnipeg organ sounded forth in shrill tones. Any and all criticisms were denounced as being inspired by pestilential partisanship and malignant and unreasoning hostility to the Roblin government. The storm of public protest continued unabated, irrespective of party lines; and the government, seeing there was nothing for it but to retreat, decided to make the telephone commission the scapegoat.

In connection with the same matter, F. C. Paterson, chairman of the Manitoba Telephone Commission, appearing before the Royal Telephone Commission of Canada, which was appointed to investigate the Manitoba government telephones, made the following statements:

The royal telephone commission was again in session this morning. Closely questioned by R. L. Barry as to the reasons which led to recommendations for increased telephone rates F. C. Paterson gave figures showing a loss of $14.65 per station on rural lines. Pressed for an explanation of this loss Mr. Paterson attributed it, among other causes, to the night service which the telephone commission had been compelled to give in certain districts.

MR. PATERSON: "When we refused it they *brought pressure to bear* which compelled the commission to grant what, from a business standpoint, it should not have given."

MR. BARRY: "What pressure was brought to bear? How could they compel you to give what you should not have given?"

MR. PATERSON: "The people demanded it, and we had to give it."

Mr. Barry repeated his question, but Mr. Paterson did not give any fuller explanation or answer. The matter was then dropped.

As indicating the difficulty of a public officer handling this matter, it is interesting to note the statement of Herbert Samuel, postmaster-general of Great Britain, in the official report of parliamentary debates under date of June 19, 1911:

* * * I am, however, now being pressed to promise immediate reductions in the existing telephone rates, and those who complain that the postoffice is not to be trusted to manage the telephone in a businesslike way because it is too much open to pressure are often themselves the first to bring political and other pressure to bear in order to secure an immediate reduction to rates.

Along the same lines it is interesting to note from a debate in the German Reichstag of March 3, 1909, the statement made by the secretary of state, for the postoffice, which was as follows:

* * * The objection is made that we pay the porters and general personnel too little and that the hours are too long. But where is the money coming from, especially when there is a constant cry for reduced rates?

In presenting the statements with reference to foreign telephone, telegraph and postoffice development, Congressman Lewis, though he apparently lays great stress upon the fact that these services are inter-related, fails to take such fact into consideration in commenting on the apparent shortcomings of our service. Thus he will, under the telegraph table, show the absence of so-called low-rate telegraph business, without at the same time calling special attention to the fact that in this country practically all traffic to nearby points is handled by the telephone. Again, in making up his comparative telephone rate statistics for foreign countries, he persists in using the maximum rate figures for American cities. It is much fairer to compare the minimum price in American cities with the minimum price in foreign cities. The mean minimum price in American cities is $23.17 per station, as against a mean foreign minimum rate of $28.80 per station.

Another point illustrating the lack of care with which the information furnished by Mr. Lewis has been prepared is in connection with the comparison of American and foreign telegraph rates. In this country the telegraph rate for ten words does not include the address or signature, which is sent without cost, while in foreign countries the rates are based upon so much per word, including in such words the address and signature, which two items as a general proposition represent twelve additional words. If Mr. Lewis had used a correct means of comparison, the ten-word message in this country costing 25 cents would in reality represent the twenty-two-word rate at 25 cents, as compared with a 22-cent message abroad, provided the message be 1 cent per word.

Another feature which Mr. Lewis should bring out, or consider, is the fact that in this country telegrams are handled on a practically no-delay basis, while in foreign countries the general rates quoted by Mr. Lewis apply only on a so-called "deferred" telegram basis. If you wish a no-delay message, you must send it at the "urgent" rates, which are usually treble the ordinary rate.

As further evidencing Mr. Lewis' lack of information, or, let us hope, the imposition which has been practiced on Mr. Lewis by someone else, we have but to con-

sider the rather humorous suggestion he makes relative to the proposed economies which the government would effect by the use of a stamp in place of the present method of paying for telegrams. Mr. Lewis carefully enumerates 27 operations incident to handling all commercial messages and states that the use of the stamp and simplified postal methods would eliminate 16 of such, to him, unnecessary operations. Among the steps which he feels might be cut out would be: Putting the time sent, sending and receiving operators' signatures on telegrams, making wet copy of received telegram, entering telegram on delivery clerk's record, examining delivery sheets to see that telegram is properly receipted for, securing receipt for telegram on delivery sheets, returning delivery sheet and cash to the delivery clerk. How any simplified plan or stamp might safely eliminate these absolutely necessary steps to insure promptness and accuracy in sending, receiving and delivering telegrams is beyond comprehension. Mr. Lewis apparently fails to realize that if his proposed plan of economies is a proper one, he would be doing an immediate public service by bringing his proposed plan to the attention of the companies or to that of the Interstate Commerce Commission, so that the companies might either be induced or compelled to adopt the stamp method.

I am also struck with amazement at Mr. Lewis' claim as to the number of telegraph offices in this country. In order to make a relatively bad showing for this country, he persists in considering as telegraph offices only such offices as are located in places separated from railroad offices, or, in other words, commercial telegraph offices. He rather criticises our maintaining offices in railroad stations and towers. As against this, he does not mention the fact that a large number of the postoffices of the country are very properly located in small country stores. Everybody knows that the railroad office in the small town is the most favorable location which might be selected for a telegraph office. Mr. Lewis also fails to lay any stress upon the fact that through the initiative and enterprise of the telegraph and telephone companies every telephone has been made a station for the receiving and delivering of telegrams.

As indicating the ease with which peculiar conditions may be distorted to picture showing combinations as having injuriously affected rates, it is interesting to call your attention to the statement made by Mr. Lewis, relative to the Chicago, Milwaukee & St. Paul Telegraph Company. This telegraph company was originally organized by members of the Stock Exchange and Board of Trade in the cities of Chicago and Milwaukee. Three telegraph circuits were erected between the Board of Trade in Chicago and the Board of Trade in Milwaukee. The telegraphic business handled was confined exclusively to stock quotations and orders to purchase and sell. The average telegram consisted of a few words, and by reason of the elimination of all delivery or extensive terminal charges, and by reason of the large volume of traffic handled during the hours in which the Board of Trade was open, and by the further reason that at hours when the Board of Trade was not in session such wires were leased to the Associated Press for its use, this company, at the rate of 10 cents per message, was able to show a fairly good condition. To meet this, to say the least, unfair condition on account of its restricted area, the telegraph companies were compelled to reduce their rates on this same class of business. After a time, this company was acquired and the rate abolished. The rate was not a proper rate, because of its being limited to a particular kind of business and the general public was in no way benefited by it. Aside from all this the present control by the Interstate Commerce Commission would prevent such change in rate unless proper and right.

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Second—The capacity and ability of the privately owned corporations to handle the telephone business of the country properly.

Having considered the capacity and ability of the postoffice department of the government to handle this problem, let us now spend a moment in recounting what the privately owned corporations of the United States have accomplished.

With reference to the policy of the privately owned telephone corporations, particularly with reference to the Bell companies, we need not be in doubt, because in the annual report of the American Telephone and Telegraph Company for the year 1910 President Vail pronounces the purpose of that company in this language:

> It is believed that the telephone system should be universal, interdependent and intercommunicating, affording opportunity for any subscriber of any exchange to communicate with any other subscriber of any other exchange within the limits of speaking distance, giving to every subscriber every possible additional facility for annihilating time or distance by use of electrical transmission of intelligence or personal communication. It is believed that some sort of a connection with the telephone system should be within reach of all. It is believed, further, that this idea of universality can be broadened and applied to a universal wire system for the electrical transmission of intelligence (written or personal communication) from every one in every place to every one in every other place, a system as universal and as extensive as the highway system of the country which extends from every man's door to every other man's door.

How well we have succeeded in carrying out this plan, the following figures will show:

As of January 1, 1914, there were approximately 13,700,000 telephones and 32,900,000 miles of telephone wire in the world. Of this the privately owned telephone system of the United States represented approximately 66 per cent of the total number of stations in the world, or in round numbers 9,000,000 stations, while Europe represented approximately 27 per cent of the total development, or less than 4,000,000. Of the total telephone investment of the world, amounting to $1,900,000,000.00, the United States represented 58 per cent, or in round numbers $1,100,000,000.00, while that of Europe was approximately $600,000,000.00, or 34 per cent of the total. These figures are particularly significant in view of the relative population of the United States and Europe as compared with the total population of the world, which comparison is as follows:

World	1,623,300,000	
United States.	94,800,000	During 1912.
Europe	400,000,000	

With less than 6 per cent of the population of the world, the United States has 66 per cent of all the telephones—not so bad for private ownership.

New York City has more telephones than Belgium, Hungary, Italy, Netherlands, Norway and Switzerland combined. Chicago has more telephones than France and Philadelphia more than Austria.

It is also interesting to note that the average investment per station in the United States is $122, as compared with the average investment per station in Europe of $176. The average gross revenue income per station in the United States is $33, as compared with $35 per station in Europe. I believe the actual comparison would be much more favorable to this country by reducing the

average investment per station and gross income per station, if we should consider in this country the enormous amount of tie and leased lines, which, though today considered in connection with the property and gross revenue in determining the average value and income per station, represents a distinct addition to the plant both in investment and use.

Just think of the thousands, yes, millions of messages which are being sent every day over so-called tie lines, leased lines and extension lines to points off premises. This, of course, represents plant investment and makes for efficiency, and should be considered by Mr. Lewis or any other fair-minded person in determining the relative efficiency of this country. For example, in the boroughs of Manhattan and Bronx, a small part of the city of New York, there are 2,441 tie lines and 5,500 extension lines connecting telephones off the premises, and as of this date, the American Telephone and Telegraph Company alone had under lease 213,996 miles of telephone and telegraph lines. Just think of this enormous mileage representing leased telephone and telegraph lines of the American Telephone and Telegraph Company long lines department. As stated before, this does not include any of the lines leased by the associative Bell companies or by the commercial telegraph companies, yet this amount of 213,996 miles represents more mileage than a great many of the foreign countries operate in their entire telegraph systems. Thus Great Britain as of December 31, 1912, had but 310,872 miles of telegraph wire, while Italy had but 129,425, and the much-talked-of New Zealand but 24,297 in its entire telegraph system. Bear in mind that none of the traffic handled over this leased wire service of the American Telephone and Telegraph Company or other companies is considered by Mr. Lewis or other advocates in determining the relative efficiency of the various systems.

Think of the enormous volume of traffic which is handled over the tie lines between switchboards and patrons and which in no way enters into the traffic figures of the companies or in Mr. Lewis' study. Think of the thousands, nay, millions of messages which pass over so-called extension lines in which mileage is involved. When you go to the branch offices of the railways or the branch offices of the taxicab companies, theater ticket agencies, and other similar institutions, you note that the attendant will use a telephone, which by means of extension line mileage directly connects him with the distant main office of his concern without the intermediate help of the telephone exchange operator. He gets his service expeditiously and economically, and yet such traffic in no way enters into the number of messages with which the system is credited. This is but one of the many intricacies which have grown up in our system and which must be considered if any fair study is to be made. This tie, leased and extension line system represents the very highest efficiency, for by means of these arrangements patrons are given better service and economies of operation are provided for in that the necessary operation in the central offices of the company is avoided; yet even so, the company must provide, maintain and closely supervise the vast amount of property and equipment used in connection with such service and the investment and cost of such maintenance and supervision should not be considered as reflecting upon the company's efficiency by failing to recognize the vast amount of traffic and service thereby rendered.

Bringing the study closer home, let us consider the development of Richmond and Virginia when compared with foreign cities and countries:

	Population.	Number of Telephones.
Richmond	160,000	18,857
Brussels	839,000	21,470
Antwerp	487,000	8,020
Marseilles	565,000	7,735
Virginia	2,061,600	86,500
Belgium	7,300,000	58,640
Hungary	21,212,000	75,738

It strikes me that if Mr. Lewis wanted to be proud of his country and its achievements, he would purposely look for points like this as indicating our efficiency, instead of merely accounting for our magnificent plant by the statement that our country is prosperous.

We, of course, are all acquainted with the magnificent progress which the privately owned companies of this country have made in improving the equipment and organization of service. For many years the United States has been considered the Mecca of all telephone engineers and investigators from all parts of the world, and there is hardly a time when representatives from some of the foreign countries are not located in the telephone centers of this country making studies of telephone practice and equipment. You, as telephone men, of course, appreciate the amount of study which is constantly being made to care for the needs of the future. You know that engineers are engaged in making studies as far ahead as twenty years with a view to being prepared to take care of requirements. You know of the magnificent pension and disability plan which has been introduced and adopted, and that the object of such plan is to reward continuous and faithful service in that as the employe continues in the service his benefits increase. You know that such plan provides for disability payments in case of sickness or accident, and to beneficiaries in case of death. You further know that the company is setting aside out of its earnings proper amounts to care for depreciation, including obsolescence. You, of course, appreciate that changes in equipment can only be made by the creation of a proper reserve for that purpose unless the value per station is to be increased by new capitalization, which ultimately must spell higher rates or bankruptcy.

I am glad that I can call as my witness Mr. Lewis, for in a speech delivered before the Republican Club of New York on January 31 he stated the following, to me, significant fact:

> Be it said for the Bell system that it is the one great corporation in our country that has not issued tons of counterfeit capital. Its stocks and bonds today represent the actual contributions of its shareholders in money to a great common enterprise, and we will not have that unfortunate circumstance to deal with in the valuation of their properties.

We are fortunate in finding that our opinion of our accomplishment as a privately owned enterprise is borne out by that of foreign authorities, and I am calling your attention to an editorial in the *Daily Mail*, London, England, published January 2, 1914, which editorial reads as follows:

> Why is it that government ownership and management of the telephones is practically always a failure? Why is it that for every thousand Europeans there is only one telephone, while for every thousand Americans there are fifteen? Why is it that the country which has done most to improve the telephone, both technically and commercially, and to popularize its use is the country in which its operation and development have been, and still are, exclusively the work of private enterprise? Why is it that not one of the innumerable discoveries that have transformed the telephone industry in the last thirty years has ema-

nated from a department of state, that European governments have been the last to adopt them and that the verdict which experts are obliged to pass upon them, with, perhaps, two partial exceptions, is that they have not learned their business? Why is it that there are great and famous towns in Europe at this moment where methods and machinery that were abandoned twenty years ago in America are still in use? Why is it that throughout the length and breadth of Great Britain and the continent hardly a single efficient long distance service is to be found? Why is it that in New York one can invariably get the number one wants, and get it at once, while in London one has often to wage a prolonged and embittering battle with a slow operator, insufficient lines, and a conversation—if any conversation ensues—that is only audible when it is interrupted?

The broad answer to all these questions is that the alertness and enterprise that are essential to telephone development cannot be expected from a government department. The characteristics of the bureaucratic mind and temperament forbid it. The organization of a government office, with a virtually irremovable staff, forbids it. The spirit of officialdom, with its traditions of subordination, its narrow professional outlook, its unwillingness to concentrate responsibility, its insensible stifling of initiative, forbids it. A government department cannot raise and discipline its staff to the same level of efficiency as a commercial company; it cannot act with the same freedom and directness as a private board; it cannot pursue a business object without deference to a hundred influences and considerations that have nothing to do with business; it cannot advertise with anything like the same boldness; it naturally seeks efficiency through economy instead of economy through efficiency; it has to think of politics and political reactions; its whole constitution prevents it from proving as enterprising as private initiative, as prompt to discard obsolete methods and apparatus, as quick to adopt new inventions, as skillful and aggressive in gathering in subscribers.

As we all know to our cost, we have government ownership and operation of the telephones in Great Britain. We shall never have a telephone system worthy of the name so long as the postoffice remains in undivided and despotic control. Sooner or later, as Mr. Webb insisted in the letter we published yesterday, that authority must be modified or delegated if our telephone system is ever to attain an even passable standard of efficiency.

The application of ordinary common sense must account for the conditions as they at present exist and for the various statements which you have heard read. As an employe of a privately owned enterprise, you owe to your employers a certain duty, and when you respectfully resist some popular clamor for a reduced rate or a departure from standard practice, your friends and associates respect you and accord to you a right to do so. You expect and obtain from your superiors encouragement and support in carrying out every reasonable requirement of the company. You are not asked as to your political belief or in any way interfered with so far as your politics are concerned. When you become a public employe, however, conditions rapidly change. Your friends in no way longer approve of your resisting popular demand for reduction in rates or departure from what is considered good practice. You no longer can plead the necessity of supporting your superior and the owners of your company, who are not only entitled to, but, by the law of the land, permitted to earn a fair return upon the capital invested. Unless you give way to such popular demand you are considered an obstructionist and can hope for no support either from the public or from your boss. Unlike as at present, your politics and your political activity become somewhat important, particularly if you hope to hold a position of some importance.

* * *

Third—The effect of a change in ownership and control on the business interests of the country.

Assuming that the ownership of the telephone and telegraph is to be transferred to the government, the present magnificent plan for accounting which the Interstate Commerce Commission has laid down for the regulation and supervision of the telephone industry by the public service commissions of 41 states becomes absolutely of no avail. Under present conditions, the telephone, telegraph and postoffice department may be considered as three rival concerns in the sense that each furnishes a means of transmitting communication. The attorney-general of the United States recently effected a separation of the telegraph and telephone industries on the assumption that they were in a measure competing. This action on his part provoked the hearty approval of President Wilson.

To postalize the telephone and telegraph industry would be a return to the condition which has just been held to be improper, with the further aggravation that it would combine the three and only agencies of communication, whereas the former condition left the telephone and telegraph separated from the mail service.

Assuming for the purposes of argument that the postoffice department of this country is as efficient as pictured by Mr. Lewis, is it not fair to assume that the wide and extended use of the telephone and telegraph in this country has had a very powerful effect in stimulating the postal department to activity? The merchant of the country now has three, and at points reached by the rival telegraph companies four, separate agencies for transmitting messages. If the mail is uncertain or slow he may use the telegraph of one or another company. If the mail and telegraph do not furnish a satisfactory means of communication he has the telephone. There is a keen rivalry. Public service commissions are engaged in investigating practices and rates, and Congress having recently instructed the Interstate Commerce Commission to proceed with a complete appraisal of all telephone and telegraph properties will have furnished a means of determining amounts earned and the propriety of existing rates.

Will the merchant of the country and the farmer desire that a monopoly be created so that every avenue of communication will be in the hands of one organization subject to no regulation but such as may be the result of political upheaval? I think not.

With reference to the statements of Congressman Lewis relative to the cost of operating independent and mutual telephone plants, it is, of course, entirely proper if the farmer desires to build his own telephone line, purchase his own equipment, erect and maintain the same, and only consider that the cost to him is that represented by his share of the central office rent and operating, but it is unfair for the farmer, as well as Mr. Lewis, to take this relatively small portion of the cost as representing the figure to be compared with that of the Bell system, unless in making such comparison he calls especial attention to the many items for which the farmer pays in a way different from that in which he would pay the Bell Company for similar items.

With a view to obtaining the indorsement of the mutual or farmers' companies and the independent companies of the country, Mr. Lewis proposes, first, that the farmer or mutual lines should not be taken over by the government, but should be operated by the farmers, as at present, with a connecting arrangement with the government service. He also intimates that leases might be issued to independent companies to operate in certain territories in connection with government service.

This proposal would place the farmers and independent companies in a position of apparently not being directly affected by the proposed change.

However, unless every part of the government-owned system is made absolutely self-sustaining, localities in which mutual or independent companies are operated will to a certain extent bear a double burden—first, in that they will, as at present, have to support their own systems, and second, in that as citizens and taxpayers of the country they will have to make up their pro rata share of the shortage, no part of which under such condition will have been created in their own territory. Included in such shortage must be the $20,000,000 of taxes now paid by private companies.

It may be said that the so-called public service motive which Mr. Lewis so frequently mentioned may justify carrying a large proportion of the expenses by means of taxation. If such a plan can be justified for the postoffice service on the theory that the service requires no particular equipment to be placed at the disposal of any individual or group of individuals, it certainly cannot be justified in the case of the telephone industry, for it is impossible to conceive of a condition where the different members of a society or the different groups will use or have available for use the same amount or kind of equipment.

Mr. Lewis expresses himself as believing that the development of the telephone in private has reached its limit. How he can possibly arrive at this conclusion is beyond belief when it is considered that reports for the last year show that 700,000 stations have been added to the systems in the United States, a larger number than has been added in any other year, and when it is known that the company during the past year, as in all other years, has been making plans as far as twenty years ahead to take care of the future.

Consideration of the proposal to have the government take over the telephone and telegraph interests of the country is not a new one. During President Taft's administration, Attorney-General Wickersham, in a lengthy letter addressed to Hon. Charles A. Prouty, chairman of the Interstate Commerce Commission, among other things had the following to say:

> This department has been engaged for some time past in an investigation of certain complaints made on the part of persons interested in independent telephone companies against the American Telephone and Telegraph Company. There are said to be some 20,000 independent telephone companies, representing investments aggregating many millions of dollars, which together operate somewhat more than 4,000,000 telephones.
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> * * * * * * * *
>
> Representatives of independent companies contend that the American Company should receive and interchange business with them on a basis analogous to that on which transportation by railroad is conducted, while the American Company maintains that such interchange is not compelled by statute and is impracticable.
>
> Many of these questions, it seems to me, cannot be appropriately dealt with by the law department of the government, but should be made the subject of regulation after a careful investigation of the whole subject by your honorable body. The powers vested in you by statute appear to me to be ample to enable you to make a comprehensive and thorough investigation of the matter. It may be that as a result of such investigation you will conclude that additional legislation should be suggested to Congress.
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> * * * * * * * *
>
> The interstate commerce act, as at present in force, makes telegraph, telephone and cable companies engaged in sending messages from one state, territory or district of the United States to any other state, territory or district of the United States, or to any foreign country, common carriers within the meaning and purpose of the act. It requires all charges for service rendered in the transmission of messages by telegraph, telephone or cable in interstate or foreign commerce, or in connection therewith, to be just and reasonable, and makes it unlawful for any common carrier subject to the provisions of the act to make or give undue or unreasonable preference or advantage to any particular person, etc., or locality, or to any particular description of traffic in any respect whatsoever, or to subject any particular person, company, etc., or locality, or any particular description of traffic, to any undue or unreasonable prejudice or disadvantage in any respect whatsoever.
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> * * * * * * * *
>
> Under the provisions of the statute referred to, the commission is, therefore, fully empowered to make the most thorough investigation into the rates and practices of the telephone companies to determine what are reasonable maximum rates to be charged for communication from one state to another, and the practice to be observed in all of the dealings of the telephone companies with the public and with other companies. No comprehensive investigation into the organization, management and conduct of telephone companies has, so far as I am aware, ever been had by governmental agency. The investigation of this department has dealt only with certain suggested violations of the Sherman anti-trust act, but the whole problem of the relation of government to the transmission of intelligence by telephone and telegraph is one of such far-reaching importance and so affects the welfare of the entire community that it appears to me to be a subject which should be thoroughly studied from the standpoint of the public, in order that a governmental policy with respect to the telephone and telegraph business may be intelligently formulated and adopted. The interstate commerce commission is clothed with the powers above referred to, and the subject is one affecting such general public interests that I venture to suggest that you undertake this work. If these suggestions commend themselves to your honorable body, I beg to add that all of the information which has been collected in this department bearing upon the subject will be cheerfully put at your disposal.

Acting on such suggestion, the Interstate Commerce Commission has actively pursued the subject and has called on us to furnish in great detail information as to mergers and acquisition of telephone properties. Such information has been furnished and the Interstate Commerce Commission is proceeding with the study, and, no doubt, in the shortest time possible, having in mind the importance of the subject, it will make a report as to the action which in its judgment is proper.

It is also proper to call particular attention at this time to the fact that with a desire to comply strictly with the law, and to so far as possible do everything in our power to aid extension of service to all, Mr. Kingsbury, vice-president of the American Telephone and Telegraph Company, in a letter addressed to the attorney-general of the United States, has agreed on behalf of the Bell system to an arrangement whereby every independent company of the United States may have service over the toll lines of the Bell system.

Mr. Lewis in his speech to Congress made the following rather significant statement:

> History of subject: In a preceding portion of this study a list has been given of the countries which have postalized the telephone along with the telegraph. In nearly every instance the postalization of the telephone service took place as a measure of protection against the encroachments of the telephone on the revenue of the postal telegraphs. It was foreseen that the telephone, in private hands, would make such inroads upon the telegraphic service as to seriously abridge, if not bankrupt, the postal operation.

This statement of Mr. Lewis but bears out the contention I make, that there is an element of competition at least between the postoffice and the telegraph. As the condition which compelled foreign governments to enter the field is not present in this country, it would seem the path of wisdom to await the result of the careful study now being made by the Interstate Commerce Commission before proceeding further in this matter. In the meantime, I trust that Mr. Lewis may become more friendly to the telephone and telegraph interests and the employes of this company and seek to locate some good in

place of merely, by every conceivable use of figures, showing us to be all that is bad so far as rates, service and efficiency are concerned.

If from the consideration and discussion of this paper and general subject you feel as I do, that it would be a calamity for this country to change from private ownership of telephones and telegraphs to government ownership, because of its injurious effect upon the best business interests of the country, I hope you will do everything in your power to bring to the attention of your friends your feeling. We must remove any notion that the only people interested in this matter are the stockholders or owners of the telephone and telegraph plants. As a matter of fact, they are the least concerned. First, the citizen must be made to realize that he is the most directly affected by any proposed change. For what good will apparent reductions in rates or so-called institutional efficiency amount to if, as a net result, the development and use are pulled down to the level of foreign countries? Next in importance comes the welfare of the loyal and capable army of employes. Instead of being compelled to accept the proposed change, they should be upheld and encouraged, and it is certainly up to you to make this fact known to your many friends.

I have absolutely no fear for the future if people can only be made to think and reason, and in this connection I wish to close my paper with Mr. Vail's famous injunction, made in his annual report for the year 1910:

> In all times, in all lands, public opinion has had control at the last word—public opinion is but the concert of individual opinion, and is as much subject to change or to education.
>
> It is based on information and belief. If it is wrong it is wrong because of wrong information, and consequent erroneous belief.
>
> It is not only the right but the obligation of all individuals or aggregation of individuals who come before the public to see that the public have full and correct information.

Government Efficiency and Telephone Service

By S. M. Greer.

Even those who are urging that our government take over the ownership and operation of the telephone admit that the development of the telephone service in Europe, where for the most part the service is directly in the hands of the governments, has been very nearly a failure when measured by American telephone standards. But here we are asked to believe that our own government in the United States will succeed where European governments have failed, because our government is so much more efficient in every direction. The failure of the European governments to cope with the telephone service is inferentially typical of their general inefficiency.

This is all flattering to our American pride. We believe in our government. Under it the country has prospered as no other country has prospered in the same length of time. At the same time, a little thought will convince us that the governments of Europe are actually far ahead of our own government in their conduct of many important governmental functions. Let us think of a few.

In France, where the telephone service is inadequately developed and poorly managed by the government, you find the government nevertheless able to build and maintain a system of roads that is vastly superior to the best of the state road systems of the United States. Roads are a means of communication, and in England, as well, road construction and road maintenance are away ahead of anything on our side of the water; nevertheless, the telephone service under the management of the British government is inferior to the American telephone system under private ownership.

In the planning of cities, in the cleaning of streets, in municipal policing, foreign governments are in advance of our own, while they make poor success with telephone service. London taught New York how to regulate street traffic, and has a poorer telephone system.

Take the question of harbor improvement. England, Germany, Holland and France have in this direction made a great deal more of their opportunities than has the American goversment, and still they cannot run a successful telephone system.

You can multiply examples of the efficiency of foreign governments, in their naval and military establishments, in their management of colonies, of their preeminence in the building up of shipping. Surely we can admit that these governments are wonderfully efficient without at all swerving from our belief in our own form of government as the best under which to live.

Then think of the people of northern Europe. You find here the greatest bankers and merchants in the world. You find leaders in every field of manufacture, in every department of technical research. Surely a people who need telephone service; surely a people who could provide their need under proper conditions.

Northern Europe is the finest undeveloped field for a telephone system in the world today. It is teeming with commerce. It is densely populated. Its people, whether they know it or not, need many times more telephone service than is being furnished to them now and are able to pay for it. The governments have shown an efficiency in many directions superior to our own in the examples which have been cited above. In fact, these governments are in a better position to develop and maintain an adequate telephone service than the government of the United States. With an equal and in some directions a greater efficiency than our own government, they have surely a more autocratic power, and are less subject to political disturbance.

The chances of government success in the furnishing of telephone service in Europe as against those in the United States are all in favor of Europe, and still the European governments have not made a success of the telephone service.

The conclusion, then, is that the European governments succeed, as our own government must have its best chance of succeeding, when they deal with the legitimate functions of the government, and that these governments fail, as our own must fail, in the furnishing of telephone service, not because of any general inefficiency, but because the telephone service is essentially a service of a commercial nature which must be handled as it has been handled in this country by business men and along commercial ideals if it is to be of its fullest usefulness to the people.—*The Transmitter.*

The Independent Telephone Association of America has moved to new quarters at rooms 1504-5 Association building, 19 South La Salle street, Chicago. The new offices are much more commodious and desirable than the old, and Messrs. Vivian and Eldridge will doubtless be inspired by their surroundings to still greater efforts for the cause of independent telephony—if greater efforts be humanly possible. The association is now engaged in printing for distribution a complete report of the recent convention, which will be sent free to all members.

Annual A. T. & T. Report

Abstract of American Telephone and Telegraph Company's Statement for 1913

THE continued growth of the Bell system, its earnings and expenses and general financial prosperity, its attitude as to government ownership, its agreement with the Department of Justice, the sale of its Western Union holdings and its relation with the general public are all set forth in detail in the annual report of the American Telephone and Telegraph Company just issued.

President Theodore N. Vail has something very definite to say in regard to the government ownership of telephones and his frank discussion of this question is perhaps the most interesting feature of the report.

GOVERNMENT OWNERSHIP AND OPERATION.

In summing up the attitude of the company towards this subject, Mr. Vail says:

Our opposition to government operation and ownership is not based on pecuniary, partisan, prejudiced or personal reasons. It is because of our interest in the upbuilding of a great public utility and its preservation.

We are opposed to government ownership because we know that no government owned telephone system in the world is giving as cheap and efficient service as the American public is getting from all its telephone companies. We do not believe that our government would be any exception to the rule.

He states that the common impression that the postmaster-general has made a report favoring the acquisition of the wire lines is erroneous. It is not a departmental report, he says, but merely the conclusions of three officials of the postoffice department, transmitted without comment by the postmaster-general.

As to possible government purchase, Mr. Vail quotes Congressman Lewis, the congressional exponent of government ownership, to the effect that there is no water in the Bell capitalization; and urges the stockholders not to be induced to part with their holdings through fear of confiscation.

He shows that there is a deficit in all government-owned systems and says that every telephone system in the world adopts the Bell system as a standard, uses the Bell operating methods and either uses Bell apparatus or copies it. And yet there is not one, he continues, that gives an approximation to the facilities that the Bell system gives or gives as good or as cheap service, all past prophecies to the contrary notwithstanding.

These deficits are not the result of a definite policy to give a cheap service to individuals at the cost of all, but are due to errors in management, such as underestimates of values and cost of new construction; disregard of maintenance, depreciation and particularly of obsolescence; impossible theories of operation and mistaken policy founded on promises, prophecies and assertions exactly the same in character as those now being used to bring about government ownership in this country, and upon a failure to understand and appreciate the advantages of private as distinguished from government organization.

There are no sound reasons given or real advantages promised for government ownership and operation which do not apply to or cannot be secured by government regulation.

Private initiative, invention, enterprise, risk, spurred on by the incentive of reward have changed the face of the world, and the resulting unearned increment largely constitutes the wealth of nations; without it many of the great scientific industrial developments would have remained scientific curiosities, even if they had been evolved at all.

The advantages of one telephone system are clearly set forth, as are the differences between the exact technical knowledge required for operation and the judicial ability necessary for regulation.

Government administration is more or less a game of politics, and while with government operation it may sometimes be possible to have efficiency, it will always be impossible to have economy.

The government owned European telephone plants, notwithstanding the low price of foreign labor, are carried at a much higher cost than those of the Bell system, and yet every one of them uses the Bell system as a model. The book value of the plant of the Bell system per station is less than 60 per cent that of Belgium; less than 75 per cent that of Austria; about 85 per cent that of Germany, Great Britain and Switzerland; and all of them government owned.

Mr. Vail brings out the fact that Americans are better supplied with telephone facilities than any other people, having six times as many telephones per capita as Great Britain and thirteen times as many as France, and that the rates here are as popular as those of any government-owned plant.

In showing the inability of the postoffice to operate the telephone business efficiently, he says:

The success of the parcel post has been set up as a reason for the government operation of the telephone and telegraph. Why it should be is hard to understand. The two services have nothing in common and are in no way comparable. The parcel post is not in any sense a new service; it has merely increased the volume of the mails by removing some limitations as to size and weight of packages mailed, and making some reduction in rates of postage for merchandise.

It would not be a question of capacity; the experiment would be disastrous principally because the postmasters are not fitted by experience or training for the telegraph or telephone business, but also because it would be secondary to their grocery-dry-goods-notion shop, their principal business.

Another reason is that the telephone already reaches more places than there are postoffices.

He concludes his remarks on this subject by saying that,

The American public has been educated to depend on the most efficient, most extended telephone service in the world. The relative number of the people reached is the largest and the average cost to each is the lowest of any important service in the world.

Government ownership would be an unregulated monopoly.

Regulation by commissions of high standing composed of individuals of ability and integrity and good, impartial judgment is the greatest protection to the public interests as against private exactions that ever was devised; its effectiveness depends upon "the standing with the public of the commission as a whole and the commissioners as individuals."

GROWTH OF THE BELL SYSTEM.

During the past year subscribers' telephone stations have increased until now there are 8,133,017, a gain of 676,943. These stations reach 70,000 localities or 10,000 more than the number of postoffices. The total wire mileage is 16,111,011, of which 92 per cent is copper.

More than half the wire mileage is underground, the total underground plant representing a cost of $181,500,000.

The number of daily telephone connections showed a growth of nearly two million, reaching an average of 27,237,000 a day. Europe has only two-fifths of the telephone traffic of the United States.

The extension of the telephone plant during the year amounted to $54,871,856, making a total for fourteen years of $646,915,200. According to present estimates the construction for the current year will cost in the neighborhood of $56,000,000, of which the local resources of the companies will supply $25,000,000.

Large reserves have been made for maintenance, reconstruction and depreciation, and a steady improvement of service has been achieved.

The report says:

The gross revenue in 1913 of the Bell system—not including the connected independent companies—was $215,600,000; an increase of over $16,000,000 over last year. Of this, operation consumed $75,400,000; taxes, $11,300,000, or 1½ per cent on the outstanding capital obligations; current maintenance, $32,500,000, and provision for depreciation, $37,700,000.

The surplus available for charges, etc., was $58,700,000, of which $16,700,000 was paid in interest and over $30,300,000 was paid in dividends.

The total capitalization, including inter-company items and duplications, but excluding reacquired securities of the companies of the Bell system, is $1,390,242,470. Of this $620,127,086 is owned and in the treasury of the companies of the Bell system. The capital stock, bonds and notes payable outstanding in the hands of the public at the close of the year were $770,115,384. If to this be added the current accounts payable—$26,471,681—the total outstanding obligations of every kind were $796,587,065, as against which there were liquid assets, cash and current accounts receivable, of $72,237,885, leaving $724,349,180 as the net permanent capital obligations of the whole system outstanding in the hands of the public.

We believe that the valuation by the interstate commerce commission when completed will confirm our repeated statements that the true value of our telephone plants is much greater than the book value.

In the case of the associated companies, excluding the American Telephone and Telegraph Company, particular attention is called to the per cent of net earnings and of dividend and interest disbursements to total plant and other assets:

Net earnings to plant and other assets.....5.69%
Dividends and interest to plant and other assets.....4.92%

In other words, the property employed earned less than 6 per cent per annum, and the dividends and interest paid were less than 5 per cent upon the value of the property, which could not be considered unreasonable.

Taken by itself the American Telephone and Telegraph Company shows net earnings of $40,576,746.19, an increase of $2,669,101.93 over 1912. The total outstanding capital stock and bonds were $504,207,300, which represent payments into the treasury of over $24,500,000 more than the par value of the capital obligations.

The number of shareholders, 55,983, showed an increase of 5,686 during the year.

ENGINEERING.

The engineering evolution of the telephone which has been accomplished by the engineers is reviewed with special reference to the marked improvment of telephone exchange equipment and methods of operation, the extension of transmission in underground circuits, and in the work of connecting the Atlantic and the Pacific for telephone communication.

In former times if engineering works endured for centuries that fact counted in their favor. In these modern times it almost seems that the electrical engineer is judged by an opposite standard. It can be said that during the development period of a rapidly growing art, frequent changes in type are to be expected. From the year 1877 to the present time improvements have followed each other with remarkable rapidity.

During thirty-seven years from 1877 to 1914 there were designed and constructed and installed fifty-three improved types and styles of telephone receiver, and seventy-three types and styles of transmitter. These figures do not include hundreds of minor improvements made in both transmitters and receivers.

At the beginning of 1914 there were in the Bell system 12,000,000 telephone receivers and transmitters owned by the Bell Company. Of these practically none were made prior to 1902, and of all the instruments now in service the average are less than five years old.

Efficient transmitters and receivers are essential to successful telephone transmission, but the problem of talking through long underground cables or over great distances could not be solved by increasing the loudness of the transmitter or the receiver.

In the transmission of speech one mile of underground cable is often equal to 50 or 100 miles of open wire overhead and in underground transmission a point was soon reached where no speech could be got by any transmitter.

Unless this difficulty could be minimized further growth of the telephone was not to be expected. At an early date our engineers and scientists had rightly determined that they must give attention not only to the apparatus at the ends of the line, but to the line itself and to the intermediate apparatus.

By 1881 we had laid experimental underground cables for a short distance alongside of a Massachusetts railroad track with small results. In 1883 several cables were laid at Boston, the longest of which was 1,500 feet. The subscribers using this cable could not talk satisfactorily further than the suburbs.

Type after type of cable was installed, only to be withdrawn in a few years and replaced by something better.

By 1887 the introduction of the twisted pair underground conductor began. This meant the abandonment of the entire underground plant of the Bell system and the introduction of the new type, without which the telephone system as we know it today would be an impossibility.

Millions of dollars were spent in this construction and reconstruction and experimental work. By 1902 the art had so far advanced by the use of Pupin loading coils and other improvements that a "loaded cable" for suburban service was successfully installed between New York and Newark.

By 1905 we had a "loaded cable" twenty miles long extending from New York in the direction of Philadelphia, and by 1906 a cable ninety miles long was successfully operated between those two cities, but in the then state of the art this cable could not be used beyond Philadelphia or New York.

By 1911 our experiments, researches and improvements in manufacture had so advanced that we were enabled to design an underground cable, capable of giving a satisfactory conversation between Washington and Boston.

By 1912 a section of this new cable was laid from Washington to Philadelphia, there connecting with the earlier type of cable to New York.

During 1913 a section of the new cable was laid between New Haven and Providence, connecting at New Haven to an earlier type of cable extending to New York and connecting at Providence to an earlier type extending to Boston.

While talking the entire distance from Boston to Washington was impossible through the old types, yet by using the underground in connection with the overhead the seaboard cities from Washington to Boston could be no longer isolated by storms destroying the overhead wires.

During the year 1913 we have made such further advances in the art of loading and balancing underground circuits and have so greatly improved the intermediate apparatus, that it is now possible to talk satisfactorily by underground wires from Boston to Washington, in part through types of cable formerly suitable for short haul distances only. These short haul cables make up 47 per cent of the total cable in the line.

In 1912 talking underground for the first time between New York and Washington represented the longest distance underground yet achieved. By 1913 this distance had been doubled. The Boston-Washington telephone cable is several times longer than any other in the world.

It is difficult to estimate the far-reaching importance of these researches and it is too early to forecast the benefits to be derived from them. Enough has been already ascertained, however, to show that they tend to greatly increase the long-distance traffic and to accomplish enormous savings in the amounts of copper wire which would otherwise be required to establish communication between remote points.

An exhaustive study of the New York-Denver line during the last year has shown that these improvements in transmission through underground wires are also applicable to overhead lines. Plans are now making for the rearrangement of the New York-Denver circuit; when accomplished, the telephone transmission between New York and Denver will be equal to that now given between points about 200 miles apart and will insure satisfactory talk from the Atlantic to the Pacific and in due course bring all points in the United States within speaking distance of each other.

In every other department of telephone development the

work of the general engineering staff has been continuous and equally fruitful.

During the period of twenty-five years practically all of the switchboards have been changed several times. Millions of dollars have been spent on inventions and experimental development. We have designed, manufactured and installed all kinds of switchboards—automatic, semi-automatic and manual—and we have exhaustively studied the practical workings of every type of switchboard in use.

At the beginning of the telephone industry there was no art of electrical engineering, nor was there any school or university conferring the degree of electrical engineer. Notwithstanding this, the general engineering staff was soon organized, calling to their aid some of the most distinguished professors of science in our universities.

As problems became more formidable and increased in number and complexity, the engineering and scientific staff was increased in size and in its specialization, so that we now have working at headquarters on the problems of the associated companies 550 engineers and scientists carefully selected with due regard to the practical as well as the scientific nature of the problems encountered.

Among them are former professors and instructors of our universities, post-graduate students and other graduates holding various engineering and scientific degrees from seventy different scientific schools and universities, sixty American and ten foreign institutions of learning being represented.

LEGAL.

In describing the work of the legal department, the co-operation of the Bell system with the Interstate Commerce Commission is shown, and the correspondence is given setting forth the agreement with the department of Justice.

Mr. Vail shows how the disposal of some $30,000,000 of Western Union stock was brought about so as to separate completely the two companies. During the three years of association the gross revenue of the Western Union increased 45 per cent, the wages of operators were increased 55 per cent, and large sums were set aside for revenue and reconstruction.

The report says that the financial condition of the Western Union with some $15,000,000 net of liquid assets was never better.

EMPLOYES' BENEFITS.

The report shows that under the pensions, disability benefits and insurance plan, in 16,054 cases employes of the Bell companies had participated in the benefits and the payments have aggregated over one million dollars.

Proposed Telephone Scheme in Afghanistan

There are rumors at present on the Indian border of Afghanistan that the Amir of this country has entered into a contract with a European engineer for a complete telephone installation between Kabul, Kandahar, and Herat, and that the line has been estimated to cost about $100,000, says Consul Harry D. Baker.

On making investigation concerning this scheme the best information obtainable is that while it is in serious contemplation by the Amir, and while there have been negotiations concerning the project with a London-Bombay firm, no contract has yet been executed nor any work commenced. The political agent of the Afghanistan government at Simla appears to be uninformed of the project.

At present the only telephone communication in Afghanistan is between the cities of Jellalabad and the capital at Kabul, a distance of 100 miles. This is a private line belonging to His Majesty, the Amir, and connects up his summer palaces at Kabul with his winter residence at Jellalabad. For some time there has been talk of the Amir considering the installation of a Marconi wireless system of communication between Kabul and Kandahar.

The three cities of Kabul, Kandahar, and Herat, would, if connected with telephone wires, form points of a triangle, of which two sides, about 300 miles each between Kabul and Kandahar and Kandahar and Herat, would be about equal, while a third side, between Kabul and Herat, would be 400 miles. The 300 miles of line from Kabul to Kandahar would have a direction due southwest and from Kandahar to Herat due northwest, while the line from Herat to Kabul would be exactly west to east. Such a telephone system would place Kabul and Jellalabad, the present residences of the Amir, in immediate communication whenever desired with the frontier of Afghanistan on Baluchistan through Kandahar, and with the frontier close to Persia and to Turkestan near Herat. Kabul is supposed to have a population of about 180,000, Kandahar of about 80,000, and Herat of about 20,000, though no census has been taken of these towns.

Abusive Language Argued as Assault

Does the use of violent language over a telephone constitute an assault? See Kramer v. Ricksmeier, 139, *Northwestern Reporter* 1091. In that case plaintiff charged that she had suffered an attack of rheumatism, which left her in an enfeebled and nervous state, and that she was making ostensible progress in the way of recovery from that affliction, when on a certain date the defendant, in the absence of the plaintiff's husband, without cause or provocation on the part of plaintiff, willfully, maliciously, wantonly and negligently called plaintiff to the telephone in her home, and in a vociferous and angry manner, knowing that her husband was absent, began to make statements about the cattle belonging to her husband, that they had broken out of their pen and were at large, and in violent and profane language ordered her to take charge of the cattle at once, with an intimation that he would be at plaintiff's home to avenge himself for an assumed wrong she had permitted in failing to keep her husband's cattle within their inclosure. That by reason of such language plaintiff became and was greatly humiliated and shocked, and caused to become greatly excited and nervous, resulting in sickness and debility, and causing her great pain and anxiety and to relapse into a feeble and debilitated condition, from which she had been unable to recover and is permanently disabled and suffers great bodily pain and mental anguish. The Supreme Court of Iowa holds that a demurrer was properly sustained for the reason that claims of the nature set forth in the plaintiff's petition are too speculative, remote, and improbable to furnish a basis for an action for damages; nor can the action be sustained on the theory that an assult is charged since it is well settled that mere words, even at short range, do not constitute an assault.

The Barbados Telephone Company (Ltd.) Barbados (West Indies), has decided to increase its capital stock by issuing 2,000 ordinary shares of £2 ($9.73) each (to be sold at a premium of 25 per cent to the present stockholders) for converting the present system of ground return into a metallic circuit system, resorting to the reserve fund for any further funds necessary for the expense incurred in rebuilding the lines. The expense is estimated at $33,600. The contract for supplies has been secured by an American supply company.

Telegraph or Telephone for Railroad Work?

Paper Read Before the American Institute of Electrical Engineers, March 13

BY W. H. CLAPP

IN MAKING a comparison between the telegraph and the telephone in their application to railroad operation, it is the purpose to state first the principal physical characteristics of each; secondly, the respective costs of providing and maintaining them, and, finally, the relative advantages and disadvantages of these two means of communication. A brief resume of the early development will possibly serve to make clearer the situation which so long delayed the advent of the telephone for handling trains.

Brief historical descriptions of the use of the telegraph and the telephone on railroads are given, the first train having been handled by telegraph in 1851 and the first handling of trains by telephone on long stretches of main line track having started as late as 1907.

In comparison with the telegraph, the telephone circuits cost more to install and operate, but effect a saving in the operation of the railroad, both directly and indirectly, as it is possible to move trains over the road more rapidly.

The advantages and disadvantages in comparing the telegraph with the telephone are summarized as follows:

In favor of the telephone are universality, saving of time, rapidity of transmission, psychological effects, promptness in raising offices, no necessity of specially trained operators, saving in expense of railroad operation, and best operation of circuit in heavy weather.

In favor of the telegraph are flexibility in handling circuits, simplicity in installing, maintaining and operating, circuit best adapted for long distances, effects of distance in transmission, saving in cost of installation and maintenance, and the standard of maintenance.

In considering what are termed the four methods of communication, namely: by personal interview, by letter, by telephone or telegraph message, and by telephone conversation, attention is called to the fact that the use of the last-mentioned method by the railroads has not been carried as far as it should.

From the beginning of the operation of railroads in the United States in the early 30's, until the early 50's, a period of twenty years, there was no system for rapid communication from one station to another. Trains were run on what was called the "time-interval system"; briefly, a ruling train had the right of one hour against all opposing trains of the same class. This practice continued for nearly ten years after Prof. Morse had sent his historical message from Washington to Baltimore. At about that time the Erie Railroad Company constructed a telegraph line, which was first used, apparently, for handling local messages along the road. Finally, in 1851, a train was successfully handled by a telegraph order for a distance of 14 miles. From this small beginning the handling of trains and messages by telegraph increased very rapidly, until, about ten years later, the telegraph was quite common on the railroads of the country. Contracts were early made between the railroads and the commercial telegraph companies whereby the same pole lines were used by both parties to support their wires along railroad rights-of-way. In the end, the telegraph became an established and invaluable adjunct in railroad operation, as will be described in more detail.

Although the Morse register was early done away with, and messages received entirely by sound, there was some opposition to this on account of the loss of the permanent record, especially when dispatching trains. This matter of not having a record was one of the principal reasons that the telephone was not sooner used for the dispatching of trains; but when this objection to the telephone is analyzed, we find that there is really no difference between the receiving of a message by sound on the telegraph as compared with receiving a message on the telephone, as no record is made in either case by the electrical or mechanical equipment proper. Apparently some of the persons who objected to the use of the telephone on account of its alleged lack of record, had in mind, when they considered the telegraph, the old Morse registers that were first used on the early telegraph circuits.

The railroads early began to use the telephone on different parts of their systems. As the commercial development of the telephone was very slow in this country up to 1890, it would apparently follow that there was not very much use of the telephone on the railroads during the same period. However, the records show that different railroads in the early 80's began to put in telephones for various purposes; not so much, however, to replace the telegraph, as to replace messenger service and to serve as an auxiliary to the telegraph. The replacement of the telegraph by the telephone, to any extent, really began only six or seven years ago. It is only during this short period of time that extensive installations of telephone dispatching and message circuits have taken place, although beginning about fifteen years ago there were numerous telephone circuits erected between terminals and principal offices on some of the railroads. These long-haul talking circuits did not primarily replace the telegraph, but in most cases merely provided additional means for communication.

While trains were handled for short distances, principally in and about terminals, beginning back in the early nineties, it was not until the latter part of 1907 that any real attempt was made to handle trains on long stretches of main-line track by telephone. The Chicago, Burlington & Quincy road was one of the first to use telephone train-dispatching circuits on main lines, and by the latter part of 1908 this company had a considerable mileage of its lines dispatched by telephone. The principal railroads in the East and the middle West at once began to install telephone circuits, so that at present there are some 70,000 miles of railroad in the United States dispatched by telephone. The use of the selective-ringing telephone circuit for the dispatching of trains was soon followed by the use of the same kind of circuit for the handling of messages. The growth of the telephone message circuit has, however, been very much slower than that of the dispatching circuit. The primary reason for this is the fact that the telephone message circuit does not meet the conditions on the average railroad to the same advantage as the dispatching circuit, there being more complications to meet than in the case of the dispatching circuit. In general, the message circuit requires a considerable amount of traffic to justify its use.

However, it will only be a question of time when all telephone dispatching circuits are paralleled by telephone message circuits.

A TYPICAL RAILROAD TELEGRAPH SYSTEM.

The outside and inside plants used by different railroads necessarily vary to a large degree on account of the different sizes, resources, locations and conditions of the railroads served. A description will be given, therefore, of the system on one of the large transcontinental railroads with which the writer is most familiar, with particular reference to the conditions about seven years ago, when the present extended use of the telephone for dispatching trains and handling messages had its beginning. It will not be necessary to describe in detail the pole lines used to carry the wires, either telegraph or telephone. It will be sufficient to say that these lines in the United States are in a great majority of cases constructed in accordance with the specifications of the Western Union Telegraph Company, which is substantial construction. These pole lines have at least thirty-five poles to the mile, where the number of wires to provide for is considerable, and in some cases, 40, 50, 60 and 70 and 80 poles per mile are used.

At first iron was universally used for telegraph wires, the size most used being No. 8 B.W.G., thoroughly galvanized. This practice, in general, was not changed as far as the railroads were concerned, except that a considerable amount of copper was put up for long-haul circuits. Of course, copper wire is used quite extensively near large centers or along the seacoast, or wherever corrosion would be troublesome. When copper wire is provided, No. 9 A.W.G. is generally used.

The average cost per mile for furnishing and erecting a No. 8 B.W.G. iron wire, including insulators, tie wires and pins, is about $25.00. This wire makes a very good telegraph circuit up to 400 miles without any intermediate offices. At this distance the wire can be worked either singled, duplexed or quadruplexed. With intermediate (way) offices on the line the above-mentioned distance would be cut down to about 200 miles. The matter of line insulation has a very important bearing on the distance that an iron wire or, in fact, any telegraph wire can be successfully operated. The distances given above assume a high grade of insulation. This mileage for the operation of iron wires, however, is ample for almost any division of a railroad, so that iron wire is very generally used in railroad local (way) circuits, copper wire being used between terminals and the principal points along the line. On the Northern Pacific system, when telephone circuits began to be extensively installed, about seven or eight years ago, there were the following mileages of copper and iron wires in use:

Copper, 4,000 miles (6,437 km.).
Iron, 11,500 miles (18,507 km.).

There were practically two through copper wires from St. Paul to Tacoma, a distance of a little less than 2,000 miles; all the rest of the circuits on and between the different divisions were iron. At that time this wire plant was considered a very good one for the purpose for which it was intended.

The cost per mile for providing and erecting No. 9 B. & S. gauge copper wire including insulators, pins and tie wires, varies greatly with the price of copper, but assuming fifteenth copper, it would be, on the average, about $38.00.

The equipment of a telegraph office is comparatively simple and needs no description. The following costs will be of interest in comparison with the cost of telephone equipment:

A way station can be cut-in on a telegraph wire, including the battery (gravity) in the office, at a total average cost of	$ 12.00
A switchboard (peg type) large enough to take care of ten wires, in and out, can be provided and installed at a cost of	42.00
The cost of providing and installing a 25-line Western Union switchboard, with twenty wires cut in and out, and eight sets of telegraph instruments with necessary tables and battery, is about	140.00
Nineteen-conductor cable (No. 14 A.W.G.) suitable for connecting the wires from the line into the offices, can be provided and installed at an average cost of 30 cents per foot.	
The average cost of providing and installing a quadruplex set would be about	200.00
The average cost of providing and installing a single-line repeater set would be about	50.00

At terminals, of course, more apparatus is necessary than at the way-stations along the line. However, a cost of $400.00 would provide and install the equipment in almost any terminal or relay office along the line, except the very largest. While the above-mentioned figures are approximate, and are averages for conditions on the transcontinental line with which the writer is most familiar, they are believed to be reasonable and to give some idea of the cost of providing telegraph circuits along a railroad.

RAILROAD TELEGRAPH TRAFFIC.

On a railroad on which the telegraph is the only means for transmitting intelligence quickly from point to point on the system, except for short distances in and around terminals where the telephone is used extensively, telegraph communication is used by all departments and by a large percentage of the employes on all occasions and on all subjects. In fact, it is no exaggeration to say in general, that the sending of telegraph messages is made so easy that a great many more messages and words are sent than necessary. The telegraph office is usually located close to the superintendent's office at division points, and at general headquarters is made as accessible to all departments as possible. In headquarters building, where a considerable amount of space and a number of floors are used, pneumatic tube systems are provided in order to carry the messages back and forth between the different offices and the telegraph office.

A considerable amount of rail-

road business is from its very nature urgent and requires as quick action as possible; for example, reports on the progress of trains over the division, the meeting of the various emergencies that arise, messages about shipments of different kinds, reports of the location of equipment along the road, and similar business.

Each section of railroad has, between terminals, at least one message wire and one dispatcher's wire, unless it is a very unimportant section such as a branch line, where one wire, in a great many cases, serves the purpose for handling both the messages and the dispatching. The length of railroad that can be handled by one telegraph message or dispatching wire depends upon the amount of traffic handled, the size of the towns along the line, kind of country through which the railroad is built, etc. On a busy single-track railroad, 100 miles (160.9 km.) would be a fair limit for telegraph dispatching of trains by the use of one circuit. The facilities necessary for handling the messages would, in a great many cases, be the same as those required for the dispatching, although there would be a great deal more variation in handling the messages than the dispatching. On an important section of railroad there is usually one message circuit that cuts into all offices along the line (way or local circuit) between the two terminals, with other circuits cutting into the more important points.

In order to handle the message service to and from the general headquarters a system of through circuits is provided between the different division points and the general offices. If the length of the railroad system requires it, relay and repeater stations are established. For example, on the Northern Pacific system there are four relay offices between St. Paul, Minn., and Tacoma, Wash. In these offices are located, with a few exceptions, the multiplex telegraph equipments (duplex and quadruplex); there the business is relayed to different offices and terminals to which direct wires are not provided. The wire testing is also handled at these points. On most railroads in the West the operators in the relay offices are on the pay roll of the superintendent of telegraph and are handled directly by him. This arrangement tends to give uniformity to the telegraph service on the system.

In order to give an idea of the extent of the telegraph system on the Northern Pacific, the following list is submitted giving the assignment, the character of circuit and the mileage to the destination of the principal telegraph wires working at the present time out of the St. Paul general office:

Circuit Assignment	Character of Circuit	Distance in Miles
St. Paul-Tacoma, Wash.	Quadruplex	1900
St. Paul-Missoula, Mont.	Quadruplex	1250
St. Paul-Spokane and Pasco, Wash.	Quadruplex	1650
St. Paul-Helena, Mont.	Quadruplex	1130
St. Paul-Billings and Livingston, Mont.	Quadruplex	1008
St. Paul-Dickinson, N. D., and Glendive, Mont.	Quadruplex	667
St. Paul-Fargo and Mandan, N. D., local, 35 offices	Quadruplex to Fargo Single to Mandan	450
St. Paul-Fargo, N. D., and Dilworth, Minn.	Quadruplex	252
St. Paul-Duluth, Minn.	Duplex	152
St. Paul-Winnipeg, Man., local, 32 offices	Single	483
St. Paul-Fargo, N. D., local, 41 offices	Single	252
St. Paul Division, local, 80 offices	Single	170
St. Paul-Duluth, Minn., local, 40 offices	Single	152

The list includes only the principal circuits and does not include certain locals operating out of St. Paul to points in the immediate vicinity of the Twin Cities.

While there is no very accurate record of all the messages handled between all points on the system, the total is estimated at about 5,000,000 per year, not including any messages at present handled by telephone. This would appear to be a large number, even when it is considered that the Northern Pacific is operating over 6,000 miles (9,656 km.) of mainline track, and it shows, apparently, the free use that is made by this railroad of the telegraph message facilities. According to the writer's observations, the conditions in this respect on other railroads are not materially different.

The cost per message for handling communications by telegraph will probably average more on a railroad than the message cost of the commercial companies, because the messages are handled on the railroad in smaller offices, and on circuits on which the number of offices is larger. The labor cost per message in Northern Pacific relay offices is a trifle over two cents; in offices along the line it would be hard to say what is the actual cost per message, on account of the multifarious duties of the operators at most of these points.

PRINCIPAL ADVANTAGES OF THE TELEGRAPH.

The principal advantages of the telegraph are its simplicity and its small cost, both as regards installation and in maintenance; this statement being made, of course, in comparison with the telephone. There are no very complicated circuits in connection with the telegraph, especially at the great majority of the offices along the line. The ordinary lineman has no difficulty in learning how to install and maintain sets of telegraph instruments and with a little experience, he is able to install duplex and quadruplex apparatus, and Western Union peg switchboards. In general, no particular care is necessary in running telegraph circuits, with respect to one another, in order to avoid induction either in the offices or on the line. In making the last statement, however, the author fully appreciates that telegraph circuits have been seriously interfered with by induction in certain cases; the conditions in mind are those which exist, as a rule, on the great majority of railroads where the telegraph is used. Also a telegraph circuit will operate under defective maintenance conditions, such as loose connections, unsoldered joints, defective office and cable-box wiring, high resistances in series with circuit, etc., where a telephone circuit would absolutely fail. In other words, the telegraph circuit usually has a considerable amount of margin in operation and will stand a large amount of neglect and abuse. The cost, as already indicated, is small for both line wires and office equipment, and while copper wire is used to some extent, iron wire serves the purpose in a great many cases where it would not be possible to use it in

connection with the telephone. The telegraph, also, has the advantage of being a very accurate means of communication. A telegraph sounder makes very clear and distinct signals, and to an expert operator, there is no question as to what has been transmitted; and, if the wire is working at all, the distance is not much of a factor, because the sounder is in a local circuit.

DISADVANTAGES OF THE TELEGRAPH.

The great disadvantage of the telegraph is its lack of universality. It requires a specialist in order to operate it; that is, an operator who has spent a considerable amount of time, years in some cases, in order to qualify for the work. When carrying on a telegraphic correspondence, one is always working through some one else, never directly. This condition is satisfactory in handling some kinds of business, but not for all kinds. The train conductor out on the line can, in the case of an accident, send messages by telegraph to his superior if there is a telegraph office near at hand in which operators are on duty, and accomplish certain results; however, if he can talk directly with his superintendent, a great deal more can be accomplished. The same is true of the section foreman out on the line, the superintendent in his office, and other employes on the division.

There is a decided lack of ability to secure information of the thousand and one emergencies that arise on a railroad, by telegraph, as quickly as desirable. This is due, first, to the fact that comparatively few employes on the system can use the telegraph directly, and second, to the fact that the telegraph is slower as a means of transmitting intelligence than its great competitor, the telephone. It takes longer to transmit a train order by telegraph than by telephone. This disadvantage of the telegraph is especially noticeable when one attempts to discuss any subject over the wire by telegraph, even between expert operators; and where it is obligatory to write out the necessary questions and answers in the form of messages to be sent and received by operators, the superiority of the telephone is even more evident.

The telegraph is at its best in handling messages that are comparatively brief, making definite statements or reports or answering definite questions. As soon as one attempts to ask several questions on different phases or points of a subject, in other words, attempts to discuss it, the telegraph becomes a comparatively slow means of communication.

Trouble is also experienced from delay in getting the offices along the line to answer their calls. In case several wires are looped into an office, and the operator is busy, he may not hear the call when made, or perhaps will pretend that he does not, and it is impossible to prove definitely whether or not the call came in properly. Some attempts have been made to meet this difficulty by providing a telegraph selector at each station that would respond to a certain combination of signals and ring a bell for the particular station desired. However, this device has not been used to any extent by the railroads.

There is, also, the trouble experienced in obtaining operators, which in recent years has become a serious problem, especially when times are prosperous. A railroad which depends at present entirely upon the telegraph has considerable difficulty in securing operators of any kind, without much regard for their ability. There has been a great falling off not only in the supply, but in the grade of men who enter this field. Twenty or thirty years ago, the conditions were strikingly different, for the reason, perhaps, that there were not then the many opportunities for men to enter electrical pursuits that there are today. Then there is the influence of the labor organization. Practically all railroads have a strong labor organization of telegraphers with which to contend. In making promotions, the labor union appears always to desire to have seniority in the service made the primary consideration, and ability or fitness for a position the secondary consideration. In general, this seniority idea tends to drive the best men out of the service and prevents the ablest men from learning to telegraph.

THE RAILROAD TELEPHONE PLANT.

The outside plant necessary in connection with the telephone is substantially the same as that required for the telegraph, except that in practically all cases copper wires are used. Two wires, however, are necessary in order to provide a metallic circuit, and they must be arranged side by side on the crossarm and transposed at frequent intervals in order to avoid induction and cross-talk from other circuits. All cables used in looping telephone circuits into offices must have their conductors arranged in twisted pairs, in order to avoid cross-talk.

The great difference between the telegraph and the telephone plants is in connection with the inside plant. Instead of the comparatively simple apparatus, already described, the telephone equipment is more or less complicated. There is first the private branch exchange, which has become so important a part of railroad operation in so many places. These exchanges are, in a great many cases, rented from the telephone companies at the usual rates. However, there are numerous exchanges privately owned and operated, the latest type to be used being the automatic switchboard. Arrangements are made to bring into these branch exchanges the telephone lines of the railroad between the different division points and terminals, to facilitate ready intercommunication. Also, in some cases, arrangements are made so that a railroad official can talk from his office over the lines of the railroad company to any subscriber's station in the public exchange system in a distant city or town.

The cost of telephone circuits for use between the exchanges along the line depends, of course, on the kind and the size of line-wire used. The cost per mile of a No. 9 A. W. G. copper circuit in place, on the basis of fifteen-cent copper, is about $75.00. The cost per mile of a No. 6 A. W. G. copper circuit on the same basis, would be about $150. The latter circuit would give, under ordinary conditions, satisfactory telephone transmission up to 1,000 miles, while the former would be satisfactory up to about 500 miles (804.6 km.).

The telephone dispatching and message circuits are the most interesting and peculiar to the railroad service. The provision of a means of selectively signaling the different stations along the line was a problem that took some time to solve satisfactorily. These selectors have different designs and principles of operation. In general, the selection is made by a step-by-step mechanism which responds to a certain number of pulsations or combinations of pulsations sent over the line, making it possible to arrange a large number of selective combinations, and thus signal any given station at will, without disturbing the others. Selectors are now made that are very efficient in operation, and will call selectively as many as 125 stations on the same line. At the stations along the line a special form of telephone set is installed for the use of the operators. The sets have a certain combination of apparatus and wiring that provides a so-called "booster" effect in transmission. This is secured by a switch which is so connected in the circuit

that when the operator is talking, the receiver is short-circuited, and when the operator is listening, the receiver is connected directly to the line and the transmitter disconnected. Head telephones are provided so that the operator may have free use of his hands. In the dispatcher's office special telephone sets are used which are wired like the sets at the way stations, except that breast-plate transmitters are usually provided so that the dispatchers can move about sufficiently in making entries on the train sheets, which are usually of considerable length and width. Some of the railroads have experimented with, and are using with some success, loud-speaking transmitters and receivers for the dispatchers. This apparatus, however, has not been developed to the point where it can be used successfully in all cases. Loud-speaking apparatus is greatly to be desired, as the dispatchers complain quite generally of the hardship of wearing continuously the head telephone and the breast-plate transmitter.

The batteries used at the way stations are in most cases composed of dry cells; they are also used in the majority of cases for the line-battery in the dispatcher's office. These cells are, on the whole, the most economical, as the line current necessary to operate a selector is rarely over 10 milliamperes and in some cases is as low as 1.5 milliamperes. However, small generators are used in some cases to furnish the necessary ringing current; storage cells, also, are used, and both are economical where the circuits are long and there are numerous busy stations on them. In a few cases secondary battery is used at the way stations, but it is not general practice, primary cells being in the great majority of cases the most economical. Wet primary cells are often used for providing the current for the dispatcher's transmitter.

The cost of providing a selector circuit ready for operation under average conditions is as follows:

Cost per station of providing and installing the selector and telephone equipment, protectors and wiring, both outside and inside of the offices, $80.00.

Cost of providing and installing the necessary telephone and selective apparatus, including the battery, in the office of the dispatcher, $250.00. Assuming that a telegraph pole line is already available, the cost of a suitable telephone circuit has already been placed at $75.00 per mile, so that the cost of providing and installing a selective telephone circuit along 100 miles (160.9 km.) of railroad, where there are thirty offices to serve, would be a little over $10,000.

A telephone circuit as described above can be used either as a dispatching circuit or as a message circuit. In arranging for the handling of messages by the telephone, the operator at the terminal office usually remains on the line continuously, thus requiring signaling in one direction only. Often separate rooms are provided for the telephone operators, but in some cases they are placed on opposite sides of the same tables which the telegraph operators use, with good results. The number of messages that can be handled on a telephone message circuit will average twice the number that can be handled by telegraph between the same offices, especially if a typewriter is used in receiving.

Two very useful and time-saving auxiliaries which are available with a telephone system are installations of telephones in booths or boxes along the railroad right-of-way at so-called "blind sidings" (where no regular operators are employed, and where there may be not even a station building) and portable telephones for the use of the train crews. Telephones of these types can be used to great advantage by the trainmen in handling the many emergencies that arise, and are also of material assistance to the dispatcher, in reducing train delays. Order forms for use of the trainmen are usually provided along with the telephones installed in booths or boxes and, in some cases, special forms of registers are provided in which the order forms are placed so that three copies can be made of all orders transmitted to the trainmen, one copy in each case being given to the engineman, the second copy to the conductor, and the third copy remaining in the machine as a record.

The portable telephone has obvious advantages in the respect that it can be used at any point along the road, by making temporary attachment to the telephone line-wires. Some of the railroads, however, have installed telephones in boxes or booths along the right-of-way every half mile; in such cases portable telephones could hardly be used to advantage. The telephones along the right-of-way are usually connected to the dispatching circuit so that the trainmen can talk directly to the dispatcher. Where telephones are provided every half mile, they are usually connected to a separate line-circuit, and provisions are made at way stations for switching it to the dispatching circuit.

The cost of a booth installed along the right-of-way, with the necessary telephone apparatus, depends on how elaborate an installation is desired; a very substantial and satisfactory installation can be provided for $90.00, but this can be reduced to possibly $30.00. A good portable telephone can be purchased for $12.00.

In addition to the uses already described, there are various miscellaneous ways in which the telephone can be used on a modern railroad. Telephone sets are placed in the observation cars of limited trains and connected to the railroad company's branch exchange, so that passengers can talk to parties in the city from which the train is leaving, up to the time of departure. The telephone is often installed in freight sheds and in freight yards so as to provide a means of ready communication from one point to another. Special types of telephone sets are installed on the desks of officials and so wired that conversations can be carried on with other officials in the same building by ringing a bell as a signal and then simply talking in an ordinary tone of voice into the telephone set, without the use of the ordinary receiver or transmitter. Local telephones are installed in the homes of trainmen for use in calling them for duty, thus saving time and avoiding the expense of employing messengers.

The method employed in handling train orders by telephone contains some points of interest. All figures or names of stations occurring in the order are spelled out, letter by letter, both in the giving of the order and in all repetitions; also, in handling a "31"* order, the name of the conductor is spelled out. The dispatcher writes the order in his train-order book at the same time that he telephones it to the operator or operators on the line. Each operator who receives the order repeats it back to the dispatcher, the dispatcher underlining each word or number as repeated. In operating a message circuit, the same general practice of spelling out words and figures is followed as in the case of the dispatching circuit. The cost of maintenance of the telephone is always more than the telegraph, for the reasons that the telephone is more complicated and has more equipment. In the author's opinion, specially trained men should al-

*A form "31" order requires the signature of engineman and conductor, whereas a form "19" order does not: see "Standard Code," of the American Railway Association.

ways be employed to maintain the telephone station equipment, although on some railroads the section linemen are required to maintain the telephone equipment; the last plan, however, produces in most cases indifferent results, in the author's opinion. In order to maintain properly four selective telephone circuits, having an average length of 100 miles each, at least one telephone inspector should be provided at a monthly rate of $85.00 with expenses, and there should be additional force if there are many telephones maintained at different "blind sidings" along the line, or special apparatus installed at various terminals, private-branch exchanges, etc. All of this expense is practically in excess of what is necessary to maintain the telegraph to handle the same work, although, as already indicated, the telephone handles a great many transactions that were never attempted by telegraph.

COMPARATIVE ADVANTAGES OF THE TELEPHONE.

The advantages of the telephone are many; some direct, some indirect and some psychological. The first and most important in the author's opinion, is that it permits direct dealing between the parties desiring to transact business. The superintendent can talk directly with his subordinate; the chief dispatcher can talk directly with the trainmen out on the line, and any two employes can deal directly with one another, if the proper telephone facilities have been provided. This is what might be termed the universality of the telephone as compared with the telegraph; every one, from the president to the section foremen, can use the telephone directly. The telephone, compared with the telegraph, is a great time saver on account of its speed of transmission. Train orders can be handled more rapidly by telephone than by telegraph. This is due to the fact that the orders can actually be transmitted faster over the telephone; also, to the fact that the operators along the line can be made to answer the calls on the telephone bells quicker than their calls on the telegraph. The primary reason for this last condition is the use of four-inch vibrating bells for way-station calling signals, which can be heard from some distance. Again, an operator does not know what is taking place on a telephone line until he comes in on the circuit, while, with the telegraph, the operator by listening can read all that is being sent, and in some cases can judge as to the relative importance of the calls for his office. A call on the telephone always involves an uncertainty as to what is wanted or who is calling; therefore, in order to be on the safe side, the operator will unconsciously drop any work in which he is engaged and answer the telephone bell when it rings. This peculiarity of the telephone constitutes one of its psychological advantages referred to above. Furthermore, the calling bell is wired so in the circuit that the dispatcher hears it ring, thus removing any doubt as to whether the bell actually rang or not. This is a very important point in favor of the telephone, as it removes any chance for an argument between the dispatcher and the operator as to whether the latter was called.

Since the dispatcher remains on the circuit continuously, the operators along the line can communicate with him without calling, by simply coming in on the circuit and stating whatever information they may have to communicate. On this account it naturally follows that more detailed information is obtained as to train movement, and that the dispatchers can keep in closer touch with their work. In using the telegraph a train dispatcher is not able to transmit his thoughts by one-tenth the speed he could express himself by word of mouth. While a dispatcher cannot send a train order ten times as fast by telephone as by telegraph, he can carry on conversations with operators and trainmen along the line at this rate, which is a great advantage to all concerned. Also with the telephone, the necessity is removed of operating trains through the medium of a large number of men of varying ability. Then there is the human side of the telephone system; the men along the line get very much better acquainted over the telephone than over the telegraph, and co-operate to greater advantage. This condition was largely unknown when using the telegraph, and is not the least of the advantages in the use of the telephone.

By the use of the telephone, the field from which dispatchers and operators can be recruited is naturally broadened. It is no longer necessary on a railroad where the telephone has been installed, with a sufficient number of circuits to keep the service intact, to depend on telegraph operators—in other words, specialists. There is, for example, one division on the Pennsylvania railroad where out of about 400 operators' positions along the line, it is necessary to fill only eight of them with telegraph operators. This is a very important point for consideration in these days, when, as already stated, the supply of telegraph operators is not equal to the demand. Also, it is possible to use as a dispatcher an employe other than one who has obtained his experience in the telegraph or telephone service, as, for example, a freight or passenger conductor.

While a telephone circuit is, in most cases, more susceptible to outside influences than the telegraph, experience shows that in heavy weather, heavy fog, mist, rain or snow, less trouble is experienced with the telephone than with the telegraph, and the telephone is affected only to a small degree by earth currents or by the aurora borealis.

Finally, we have for consideration the saving in the operation of the railroad by the use of the telephone. Unfortunately, it is hard to show in all cases a saving, because many of the best-known economies are more or less intangible. One is generally sure that he is saving time by using the telephone, and it seems at least a fair assumption that there is a corresponding money saving. The psychological effects can be capitalized to some extent, but it is generally difficult to do it. In the way of direct saving, the ability of the dispatcher to get his trains over the division quickly, thereby economizing in operating expenses, is the most evident and easiest to understand. This is especially noticeable in the amount of overtime that can be saved in the pay rolls of the trainmen and the enginemen. As it is conservatively estimated that the trains can be handled over a division from 10 per cent to 20 per cent more rapidly by telephone than by telegraph, an approximate estimate of the overtime saved can be prepared by considering a certain operating division before and after the telegraph is replaced by the telephone. For example, on a certain division where the Northern Pacific is now installing the telephone, both for handling trains and for handling the messages along the line, it has been estimated that a saving of about $200.00 per month will be made in overtime paid to trainmen and enginemen, to say nothing of the other indirect savings of which mention has already been made. In some cases a direct saving can be made by using a smaller number of dispatchers when handling a given section of railroad by telephone, as

compared with the telegraph. For example, there is a division on the Northern Pacific which is made up of four consecutive districts, having an average length of a little over 100 miles each. Part of the year, the four districts can be handled by using two telephone dispatching circuits; but when there is considerable business on the railroad, four dispatching circuits are used. It would be necessary with the telegraph to handle the four districts by using four circuits at all seasons of the year. As it requires three dispatchers to handle one dispatcher's circuit during the entire twenty-four hours, and as the salary of a trick dispatcher is $155.00 per month, the abandonment of any of these positions even for a part of the year is a very desirable thing from the standpoint of saving in expenses.

Savings are also made possible by the installation of telephones in booths or boxes at or near small and unimportant stations along the line where operators have been employed, thus resulting in the closing of these stations for a portion of the day, at least, and reducing the number of operators. In some cases, less expensive operators are employed when the telephone is installed. This practice is quite common on some of the railroads, and is done both at the stations along the line and in the offices at terminals and headquarters. In the latter case female employes are often used to advantage, as all that is necessary is a reasonable familiarity with the business to be handled and the ability to operate a typewriter.

DISADVANTAGES OF THE TELEPHONE.

The principal disadvantages of the telephone as compared with the telegraph is its cost of installation and maintenance. However, these increased costs are overcome by the savings that are made possible. Another disadvantage is that the telephone, in the present state of the art, is not adapted, on account of excessive cost, for use on the railroad for any considerable distance. While there is a circuit about 1,000 miles in length in operation on one railroad in this country, at least, this circuit is used entirely as a talking-circuit and is not used for message work. It requires a good margin of transmission to handle messages over a telephone circuit and, according to the author's experience, a circuit equating to more than 26 miles of standard* cable should not be used in railroad service; at least, not in connection with handling trans or messages.

While it is possible to construct a telephone circuit 2,000 miles long, or even longer, that would have the proper transmission efficiency, it will apparently be some time before a railroad can justify such a circuit, from the standpoint of first cost and maintenance expense and benefits derived. The telegraph will probably continue to handle the messages for the long distances, such as 500, 1,000 or 1,500 miles, for a considerable time to come.

The telephone is not as flexible as the telegraph when making patches in cases of trouble on the regular wires. For example, suppose that the entire pole-line is down at some point between two terminals, it is very easy to re-establish a telegraph circuit over some second route, even though it be very circuitous. If the circuit is too long for direct working, repeaters can be cut into the circuit at intermediate points. For example, it is entirely possible for the Northern Pacific to obtain a circuit from the Western Union Telegraph Company via Omaha, Denver, Cheyenne, Ogden and Portland, and work directly between its St. Paul and Tacoma offices. But it is impossible to establish an emergency telephone circuit for the distance involved in the above example, or for considerably shorter distances.

The telephone requires a much higher efficiency of maintenance than the telegraph. This is not, strictly speaking, a disadvantage. In fact, the telegraph wires and apparatus should be maintained as well as the telephone system, but in practice this is not done except in very few cases. Also, there are more delicate parts in the telephone apparatus, to get out of order, than in the telegraph. The required efficiency of maintenance is not as easy to establish, on a railroad, as might be thought. The telegraph and telephone plant is necessarily spread out over the entire system, without very much of it in any one place; this makes it difficult to secure adequate supervision, and it is not easy to impress upon the different employes who have to do with the maintenance of the plant, the importance of keeping the lines and apparatus in proper condition.

SUMMARY OF RELATIVE ADVANTAGES OF THE TELEGRAPH AND THE TELEPHONE.

The following summary presents the respective advantages and disadvantages of the telegraph and the telephone.

The advantages of the telegraph are: (1) Flexibility in handling circuits; (2) simplicity of installation, operation and maintenance; (3) best adapted for long-distance service; (4) least affected by distance, in respect to transmission efficiency; (5) low cost of installation and maintenance; (6) the necessary standard of maintenance is not difficult to secure.

The advantages of the telephone are: (1) Universality; (2) saving of time; (3) rapidity of transmission or dispatch of business; (4) psychological effects; (5) minimum delay in getting offices to answer calls; (6) lack of necessity of trained specialists to operate the service; (7) saving in total expenses of railroad operation; (8) minimum impairment of transmission efficiency in heavy weather.

APPLICATIONS OF THE TELEPHONES.

As yet very few railroads are using the telephone as much as they could or should. Because many of the economies with the telephone are more or less intangible, railroad managers are rather cautious in authorizing its wholesale installation. They are usually ready to authorize telephone dispatching circuits, as the savings from them are more easily understood than in other applications. In the author's opinion, the up-to-date railroad of the future will handle its operating divisions entirely by telephone, the telegraph being used only for message work for long distances between the terminals and the general headquarters. On the divisions, the typical way office will have no telegraph instruments, and will depend entirely upon the telephone for handling all messages. At all terminal points and important offices along the line, private-branch exchanges will be installed, which will be connected with each other by means of talking circuits, so that any two employes on the same division or adjacent divisions can communicate with one another easily and quickly. Telephones will be installed in booths or boxes along the right-of-way at frequent intervals, such as every half-mile, and the necessary lines and apparatus provided so that trainmen, section men or any one out on the line can obtain ready communication with persons with whom they may have business to

*Standard cable has a resistance of 88 ohms per unit (No. 19 A. W. G. metallic) and a mutual capacity of 0.054 microfarads per mile.

transact. Where portable sets can be used to advantage, they will be furnished to such employes as trainmen, section men, linemen, signal maintainers, etc., so that connections can be made directly to the telephone line-wires at any point along the line. Ample telephone service will be provided at all points, especially where private-branch exchanges are installed, so that all employes having any legitimate need to talk to one another can do so without delay, whether in the same city or town, or at points on the same division, or other divisions, within a possible limit of 1,000 miles. Also, the railroads will not forget to provide ample service so that the public can reach certain authorized employes by telephone promptly, when necessary.

The above outline of the applications of the telephone to the needs of a railroad is not entirely prophecy, since there are railroads in this country already using the telephone, on portions of their systems at least, almost as extensively as contemplated in the foregoing description.

There are four general methods of communication, namely, by personal interview, by letter, by telegraph or telephone message, and by telephone conversation. There are certain business transactions that can best be handled by only one of the above methods; there are others that can be handled by two or more of these methods; and in some cases, by any one of the four. Without doubt, there is always one of these methods, as a rule, that is best adapted to any particular transaction. While a great deal of traveling is done by railroad men, there is still, in the author's judgment, a lack of personal contact in a great many of the departments between the man in charge and the men in the field; in other words, there is a lack of supervision. There is probably no lack in the number of letters written, and there is no doubt at all that too many telegraph messages are sent. The telephone as a means of communication is not, however, used as it should be on the railroads in this country. As already pointed out, the local use of the telephone has been well developed in a great many places, and the same is true of its use in dispatching trains; but its universal application as a means of communication, and its substitution for and its use as an auxiliary to the telegraph, have only in a very few instances been carried to a logical conclusion.

The Audion and the Telegraphone.

The ease with which voice records are made on the fine steel wire of a telegraphone, the fidelity of these records when not intense enough to magnetically saturate the wire, and the practically unlimited length of a record (30 minutes or more), once appeared to give to this wonderful device possibilities which were quite beyond any to be hoped for from the cylinder or disc phonograph. However, the faintness of the reproduction has limited the commercial application of the telegraphone to an office dictating and telephone-recording machine. All attempts to reliably amplify telegraphone records so as to throw the sound out into a room by use of microphone relays have failed. Adjustments are too delicate and transient, and distortion excessive.

With a three-step audion amplifier Dr. Lee De Forest can supply "loud speaking" telephone receivers, and distribute music or voice records over a small hall in sufficient volume. From four such loud-speaker receivers nested together a violin record on the telegraphone can be heard at a distance of 250 feet in quiet open air. By use of larger bulbs for the third amplification, and with two or more of these in parallel, each supplying six or more loud-speakers, any reasonably-sized enclosed space can be filled.

This amplification of telegraphone records has revealed a number of interesting peculiarities of that instrument hitherto unrealized. Notably has it shown how imperfect and unreliable device a carbon microphone, voice-actuated, really is. The haphazard action of packing, friction and the natural vibration periods of the diaphragm are exasperatingly demonstrated. Dr. De Forest is at work on these problems at the present time, investigating the best methods for recording various types of music, voice, etc., using for this purpose both the microphone and special forms of magneto transmitter. The introduction of the telegraphone to the music-reproduction field awaits now merely a perfection of proper methods of recording.

The problem of recording high-speed wireless telegraph signals has been repeatedly attacked, using photographic tape records with the Einthoren string galvanometer and crystal rectifier detector. The multiplicity of delicate adjustments, and the obliterations which even moderate atmospheric disturbances cause in the records, convince in time the most optimistic investigators in this field of the basic fallacy of this method. Attempts have been made to record wireless signals by means of the telegraphone, but the fact that excessively loud signals (such as can be heard 3 feet from the telephone receiver) are needed to make satisfactory telegraphone records have kept this method inapplicable in practice up to the present time.

Now, however, with the three-step audion amplifier relaying the detector signals the telegraphone becomes a simple and surprisingly reliable rapid recorder. A tape-actuated Wheatstone transmitter, controlling by two successive relays the wave-length of a 12 kw. Poulsen arc transmitter, sends Morse at the rate of 60 words per minute. The received *tikker* signals are amplified and recorded on a telegraphone wire running at a rate of about 800 feet per minute. In reproducing the record this wire speed is reduced to approximately one-third. The pitch of the *tikker* signals as thus reproduced is, of course, very low; but with the above speed-reduction ratio these signals, even without re-amplification, are still sufficiently loud to permit the use of a typewriter by the transcribing operator. For speeds higher than 60 words per minute it is necessary to obtain the incoming signal in form of a high-pitched note, which upon reduction for transcribing at 25 words per minute has still a pitch of some 150 per second. Methods for accomplishing this latter have been recently worked out by the writer.

The telegraphone rapid receiver has been in daily commercial use for several months at the arc stations of the Federal Telegraph Company between San Francisco and Los Angeles. The method is not limited to arc transmitters. In fact, the musical spark stations offer certain advantages for this method of high-speed recording. It is necessary only that the received signals should be 50 to 100 times "audibility" before amplification.

While it is yet too early to speak authoritatively on the subject, there appears no reason why the audion amplifier should not also be applied to excellent advantage in submarine cable recording and relaying.

Recent Telephone Patents

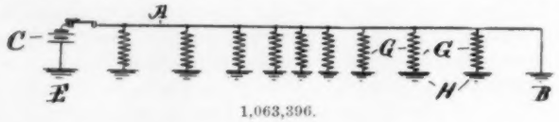
A Brief Digest of those Current Specifications Most Interesting to Telephone Men

BY DAVID S. HULFISH

UNITED STATES Patent No. 1,063,396. Means for increasing the speed of transmission of signals over telegraph and cable lines. George Seibt, New York, N. Y. (Application filed October 10, 1909.) Artificial leakages are connected to the line conductor at points, the distances between the leakages being greater as the ends of the line are approached.

1,063,601. Antiseptic mouthpiece for telephones. Max Rosenwald, New York, N. Y., and John C. Doran, Danbury, Conn., assignors to Frank A. Weeks Manufacturing Company. The perforated plate commonly seen as a part of the funnel is made a part of the casing and is surrounded with spring fingers to grip the funnel. An antiseptic gauze may be stretched over the perforated plate and may be held in place between the edges of the funnel and the transmitter case.

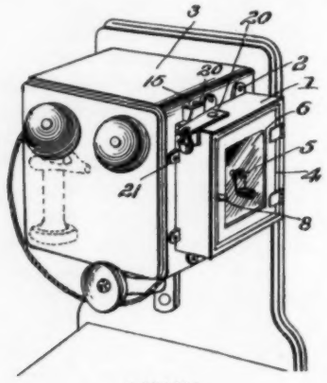
1,063,599 and 1,067,274. Telephone register and lockout. Charles V. Ritchey, Washington, D. C., assignor to Phone Call Recorder Company. The telephone at the substation is equipped



1,063,396.

with a call register and lockout devices and facilities are given also whereby the telephone user may cause an emergency signal at the central office at such times as he may desire when "locked out" and whereby the central office operator may hold conversation with him despite the lockout.

1,063,651. Signaling attachment for magneto hand generators. William S. Burnett, Milwaukee, Wis., assignor to Morse Code Signal Company, Milwaukee, Wis. (Application filed April 12, 1909.) An adjustable device will permit only a predetermined number of cycles of current to flow from the generator, the number of cycles in each signal being adjusted before each signal is sent. Provision is made also for getting the generator up to proper speed by permitting the signal to begin only after a predetermined number of armature revolutions have



1,065,014.

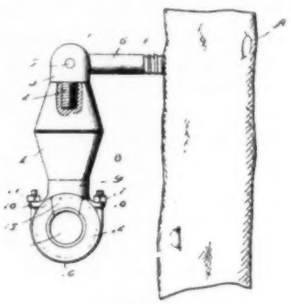
been made subsequently to the setting of the signal controlling attachment.

1,064,049. Apparatus for recording effective and ineffective telephone calls. Edward Hill Bridge Spotswood, Victoria, Australia. A connecting cord pair is provided with two sets of magnets of which one set operates its armature by the insertion of the answering plug, the armature by its return operating one of two meters, either an "effective-call meter" or an "ineffective-call meter." The second set of magnets attracts its armature when the called line responds, and the operation or non-operation of the second armature determines the meter to be operated by the first armature.

1,064,433. Method of reducing telephonic disturbances. O. B. Blackwell, Maplewood, N. J., and G. A. Anderegg, Oak Park, Ill., assignors to American Telephone & Telegraph Company, New York, N. Y. The method of balancing conductors which occur in successive groups, which consists in determining the inequalities in the conductors of the groups and then so joining the conductors in successive groups that the inequalities tend to neutralize one another.

1,064,471. Thermotelephone. Bronislaw Gwozdz, Schoneiche, near Berlin, Germany. The patent pertains to the mounting of a very fine wire by imbedding it in a plastic body which in turn is enclosed in a metal holder.

1,064,492. Muffler attachment for telephone. George Kracker, Philadelphia, Pa. A voice-protecting attachment for mouthpieces that the speaker's voice may be carried to the telephone transmitter without being heard in the room in which the telephone

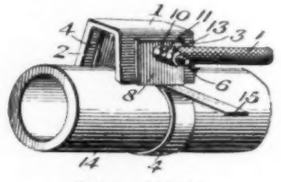


1,066,395.

is located. The patented muffling feature is a spiral sound muffling band within the muffler casing.

1,064,599. Telephone attachment. William Bimson, Philadelphia, Pa. The attachment is of the class adopted to hold the telephone receiver of a portable desk telephone in such manner that the telephone user may press the ear against the receiver and have both hands free for writing or handling papers while talking. In the present improvement a weight is provided for drawing the telephone hook lever down when the telephone is not in service, a latch being provided to hold the weight up during conversation.

1,064,719. Telephone trunking system. E. D. Fales, La Grange, Ill., assignor to Automatic Electric Company, Chicago, Ill. (Application filed July 6, 1908.) In an automatic telephone system, shown as of the Strowger type, a two-way trunk line of four conductors is shown, with a switch at both ends and



Reissue 135,589.

means for making it test busy at both ends when seized at either end.

1,064,998. Telephone call recorder. Henry K. Sandell, Chicago, Ill., assignor to Herbert S. Mills, Chicago, Ill. The call recorder has two meters, one of them a call counter for counting the total number of conversations and the other a register of overtime upon calls which are held for conversation beyond a predetermined time limit. A clock movement is provided, started at the beginning of conversation to drive the overtime register, but a lost-motion device between the clock movement and the register so that the register does not begin to move until after the lapse of the predetermined conversation interval.

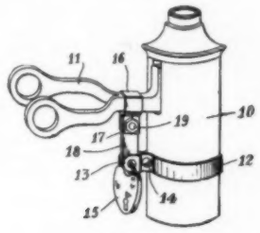
1,065,014. Coin operated telephone attachment. George P. Wriborg, Athelstane, Wis. The coin box is intended for use with magneto telephones. A box is formed to enclose the hand generator crank handle. The door or front plate of this enclosing box may be swung out of the way to permit the crank to be

grasped and turned. The box may be unlocked by dropping a coin into a slot or by a key by authorized persons.

1,065,570. Telephone receiver support. C. D. Wightman, Glenwood Springs, Colo. The telephone receiver is to be supported so that the ear of the telephone user may be pressed against it. It is held by an arm upon the edge of the transmitting casing, the arm being hinged upon the casing and provided with a spring which may balance the pressure of the telephone user's ear.

1,065,600. Switchboard plug cleaner. L. J. Euchenhofer and W. C. B. Anderson, Dayton, O. A compact case contains a small motor and cloth wheels for cleaning and burnishing the switchboard plugs.

1,065,805. Telephone attachment. Simon J. Heimbuecher, Jr., Pittsburgh, Pa. For holding the receiver against the ear



1,066,786.

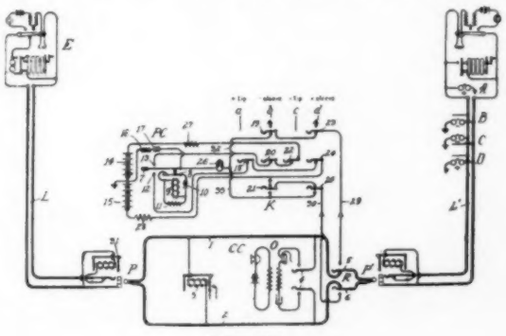
of the telephone user an extensible arm is fixed within the fork of the telephone hook and when the telephone is not in use the weight of the receiver depresses the hook.

1,066,176. Telephone call register. W. G. Bell and W. H. Minto, Boston, Mass., said Minto assignor to said Bell. The purpose of the device is to enable a telephone user to make a record of the service obtained from a telephone. Several counters are provided in a suitable cabinet, a shelf for a portable desk telephone being also provided upon the cabinet. The lifting and replacing of the telephone registers one call upon a totaling meter and it then is necessary for the telephone user to register the call upon one of the classification meters, as "inward," "outward," "busy," "toll," etc.

1,066,388. Sanitary telephone attachment. G. W. Downs, New York, N. Y. A cheap strip of stiff paper is so punched and cut that it clasps the edge of the mouthpiece or funnel and hangs below to offer advertising space.

1,066,395. Insulator. Oliver J. Fisher, Walpole, Mass. The insulator provides for swing of the cable or wire. A stud is screwed into pole, tree or other support and from it a pendant link holds a tubular collar for the cable or wire.

Reissue Patent No. 13,589. Ground joint connection for electric conductors. John C. Vogel, Philadelphia, Pa., assignor



1,067,527.

to the Fairmount Electric & Manufacturing Company, Philadelphia, Pa. (Original patent No. 692,926, dated December 22, 1908.) A ground clamp comprising a flexible band, means for tightening the band comprising metal plates and screws and a binding post for attaching the conductor.

1,066,786. Locking device for telephones. C. C. Bielitz, Brooklyn, N. Y. This novel telephone lock comprises a belt for the stem of a portable desk set, a link for the hook lever and a padlock for attaching the link to the belt so that the hook lever cannot be lifted.

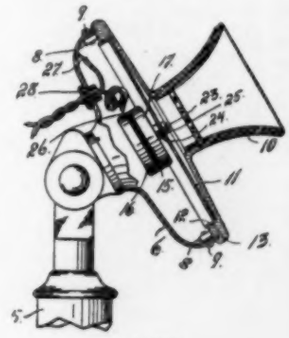
1,067,354. Train telephone connection pole. William Leach, Moose Jaw, Saskatchewan, Canada. The device is for connecting a telephone of a railway train to telephone wires beside the track on emergency. A pole has extension conductors for engaging the line wires, sockets for lifting the conductors to the line wires and detaching cords for removing or releasing the conductors from the line wires.

1,067,527. Signaling system. Charles A. Larson, Highland Park, Ill., assignor to Kellogg Switchboard & Supply Company, Chicago, Ill. A signaling system using biased bells rung plus or minus from either wire to earth, and using a pole changer as a source of ringing current. The novelty of the system is found in the circuit relations of the ringing keys and the pole changer.

1,067,561. Telephone receiver casing. Levi Swanson, New York, N. Y. The receiver shell is of perforated pressed metal, the shell then being covered with an insulating and finishing coat which by penetrating the perforations and by being united by ribs of similar material inside the shell is rigidly fixed in place.

1,067,718. Telephone transmitter. Jairus Collins, Quaker City, Ohio, assignor of part to W. P. Collins, Cripple Creek, Colo. The diaphragm has an insulation plate and a front electrode supported upon the center of the diaphragm, while a casing, including the back electrode is hung loosely from the insulation plate, the variable resistance material being between the two electrodes as usual. The new feature is that the back electrode is not solidly mounted, but hangs loosely from the diaphragm.

1,067,715. Telephone voice relay system. Sidney George Brown, London, England. A new method of connecting a voice amplifying relay to the telephone circuit. The relay should be attached at about the middle of the telephone line. A coil of high self-inductance is connected serially in each of the line



1,067,718.

wires. The receiving winding of the speech current amplifying device is connected to the terminals of one of these coils and the remaining terminals of the amplifying device are connected to the two-line coils at about the center points, the points of connection being adjustable for balance. The division of current in the line windings renders the transmitting circuit of the amplifier neutral or differential upon its receiving helix.

1,068,410-11-12-13. Method and apparatus for coating wires. Lewis W. Chubb, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. (Applications filed June 25, 1907.) The four patents cover the method of coating wire with enamel by drawing the wire through tanks of enamel in solution and warming the wire while immersed in the solution by passing an electric current through it. The different patents show variant methods of producing the warming current in the wire.

1,068,439. Electrical accumulator. Pascal Marino, London, England. The accumulator grid comprises a metal base, a coating of lead and finely divided carbon and a second coating of an acid-resisting conducting substance. The grids are covered with the first substance and heated to a dull red, then covered with a composition of rubber, asphalt and lead powder.

1,068,521. Automatic telephone switch. George E. Mueller, La Grange, Ill., assignor to Kellogg Switchboard & Supply Company, Chicago, Ill. (Application filed July 27, 1910.) The field of waiting contacts, or the "jack field," is of spherical inner surface. The wiper arm is pivoted at the center of this sphere. By revolving the support of the wiper arm the wipers swing with the rod and are brought opposite the ends of a vertical row of waiting contacts or jack teeth, then by swing upon the rod and rise to the desired points.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Census Report on Telephones

Preliminary figures of the forthcoming quinquennial report on telephones of the United States have been given out by Director W. J. Harris of the Bureau of the Census, Department of Commerce. They were prepared under the supervision of W. M. Steuart, chief statistician for manufacturers.

The statistics relate to the years ending December 31, 1902, 1907, and 1912. They include the total wire mileage and the total number of telephones reported for all systems in the United States that were in operation all or any part of those years. They do not include private telephone lines used exclusively for communication between different departments of the same establishment unless connected with lines elsewhere through a private or branch exchange. The number of telephones includes all installed, including those furnishing service through private branch exchanges, local pay, and outlying toll stations.

During the year 1912 the length of wire used on the telephone lines of the United States amounted to 20,248,326 miles. This represents a gain of 15,347,875 miles during the decade, or an increase of 313.2 per cent; there were 8,729,592 telephones in use, or 6,358,548 more than the number reported for 1902, an increase of 268.2 per cent.

The number of telephones reported by the Bell telephone system increased by 137.8 per cent during the period from 1902 to 1907, and by 62.4 per cent from 1907 to 1912. During the same periods the number of telephones reported by all other companies and systems increased by 183.4 per cent and 22 per cent, respectively. In 1902 the Bell system controlled 69.1 per cent of the wire and 55.6 per cent of the telephones in use. In 1912 this system controlled 74.7 per cent of the wire and 58.3 per cent of the telephones. The proportion of the total wire mileage and total number of telephones owned by the Bell telephone system has increased during the decade, while that owned by the independent companies has decreased.

The purpose of telephone companies is to afford communication between distant points, and the amount of business is usually expressed by the number of separate messages or talks that pass over the wires. While some companies keep an accurate account of the number of messages, as a rule no record is made from which accurate statistics can be compiled. It is estimated that there were 13,735,658,245 messages or talks sent over the telephone lines of companies which had an income of at least $5,000 during 1912. A message may represent either a few words or a long conversation, and therefore does not indicate the extent to which the equipment is used. It was impossible to obtain even an estimate of the number of conversations over the private branch wires and the party lines which do not require interconnection at the public or central exchanges. No estimates were required concerning the number of messages for the 1,402,844 telephones on the lines of small companies which had an income of less than $5,000 during 1912. Messages for these smaller systems were included to some extent at the census of 1902; therefore the statistics of messages reported for the three years are not strictly comparable, and they should not be considered as representing the total amount of business transacted by telephone systems of the United States during the year 1912.

The figures in detail are shown in the following table:

UNITED STATES.

Year—	Miles of Wire	Number of Telephones	Estimated No. of Messages or Talks*
1912	20,248,326	8,729,592	†13,735,658,245
1907	12,999,364	6,118,578	†10,400,433,958
1902	4,900,451	2,371,044	5,070,554,553
BELL TELEPHONE SYSTEM.			
1912	15,133,186	5,087,027	9,133,226,836
1907	8,947,266	3,132,063	6,401,044,799
1902	3,387,924	1,317,178	3,074,530,060
ALL OTHER COMPANIES AND SYSTEMS.			
1912	5,115,140	3,642,565	4,602,431,409
1907	4,052,098	2,986,515	3,999,389,159
1902	1,512,527	1,053,866	1,996,024,493

*The number of messages reported by the Bell telephone system includes only completed calls, while the figures for all other companies may include some original calls not necessarily completed; such as calls that the operator reports as "Line busy," or "Does not answer."

†Exclusive of companies with an annual income of less than $5,000.

Automatic Exchange at Regina, Canada

The 3,600-line automatic telephone plant installed at Regina, Canada, by the Automatic Electric Company of Chicago, was cut into service at midnight, January 17, 1914, by the officials of the Saskatchewan provincial government.

Under the direction of W. Warren, chief engineer of the telephone and telegraph department, men were stationed at the main frame of the old exchange, where strings had been placed behind the heat coils. Pulling these cut the manual board out of service and the crew then went to the automatic switchboard in the new telephone building, adjacent to the old structure, and quickly removed the toothpicks placed in the protectors, thereby opening the lines to the automatic switchboard. In the automatic switch room, a man was placed in charge of each group of 500 switches and these men were able to detect any troubles as soon as the toothpicks were pulled. The actual time for cutting the exchange into service was 30 minutes.

On the following Monday and Tuesday, the traffic was heavy and the complaints numerous, but by the cooperation of the government forces and the Automatic Electric Company's installers, the troubles incident to a cut-over were cleared within a short time and the service soon compared very favorably with any automatic exchange.

The new building which houses the automatic plant at Regina is 85 feet long by 75 feet wide, two stories and basement, and is entirely fireproof. A forced ventilating system is used and a vacuum system for cleaning the switch room, switchboards, etc., has been planned, but not entirely installed to date. In the basement are located the power, heating and ventilating plants and a branch store room for small supplies. The power plant is in duplicate and so arranged that a failure of the commercial current normally used, will not cripple the telephone service.

The exchange is completely equipped with power boards, ringing and "busy back" machines, and all other

accessories necessary for giving automatic service, the whole being manufactured and installed by Automatic Electric Company.

One of the most interesting features of the Regina exchange, is the 16-position toll board, also manufactured by Automatic Electric Company and so arranged that its operation is reduced to a very simple form. The general arrangement is as follows:

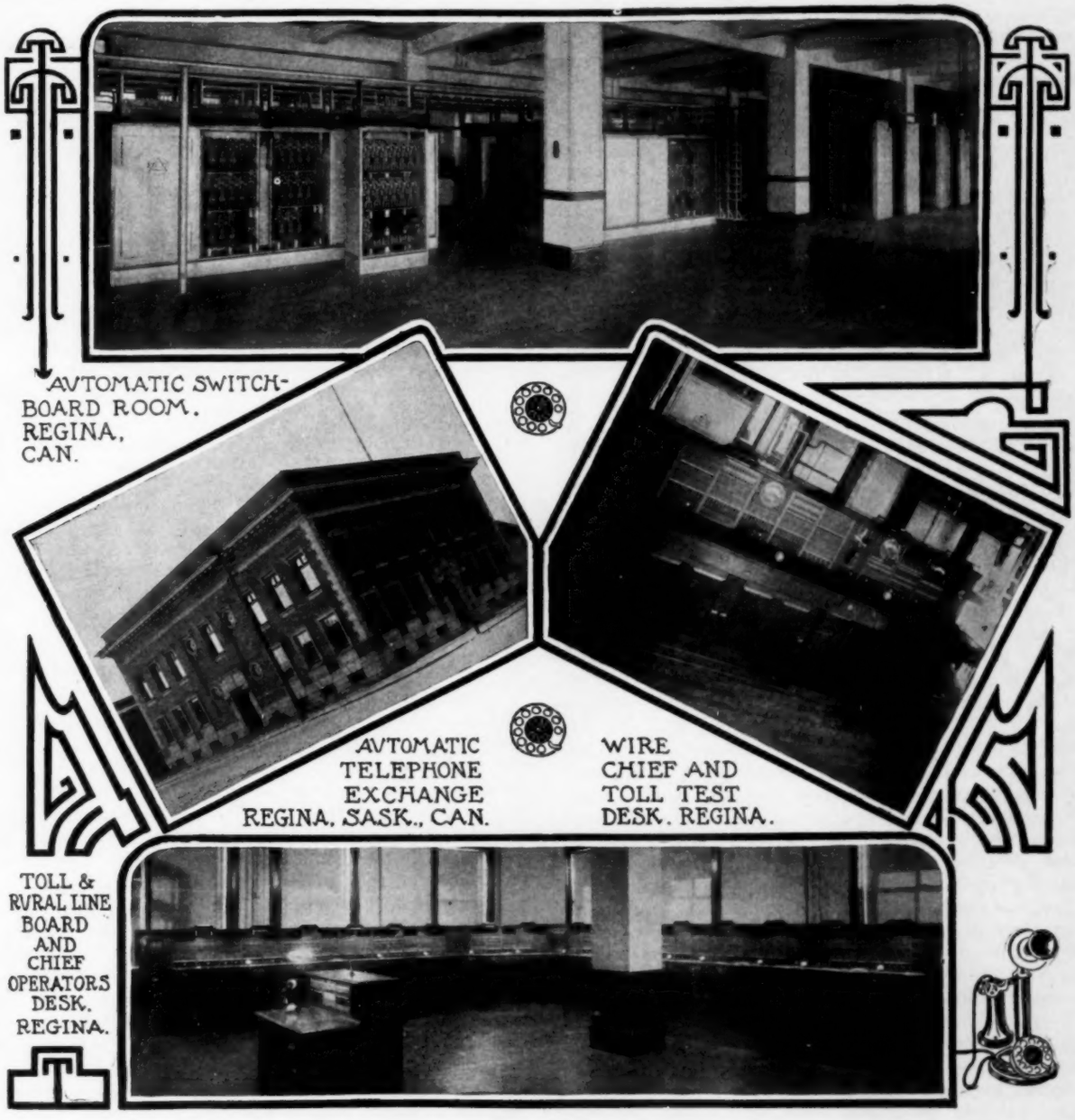
The first and second positions are wired and equipped as toll recording positions with key ending toll recording trunks which give discriminating tone test service on all calls. The third and fourth positions are wired and equipped for through switching and are arranged to connect toll to toll calls. The fifth position is wired and equipped for rural service, with a capacity of 50 rural lines. The sixth position is wired and equipped for pay station service, with a capacity of 60 pay-station lines. The seventh to the sixteenth positions, inclusive, are wired and equipped as regular long distance positions, with a capacity of ten answering jacks per operator. The second and third positions are arranged as the night section.

The cord circuits on the long distance positions are of the combination type and are arranged to handle calls from long distance to automatic, and vice versa.

The cord circuits on the through positions are of the single supervision type, because of transmission standards. Some of these cords are equipped with repeating coils and some are not and are distinguished by the color of shell on the plug.

The cord circuits on the rural, pay station and night positions are of the universal type, designed to handle the following calls:

Automatic to rural; automatic to pay station; automatic to toll; pay station to automatic; pay station to pay station; pay station to toll; pay station to rural; rural


AUTOMATIC SWITCH-BOARD ROOM. REGINA, CAN.
AUTOMATIC TELEPHONE EXCHANGE REGINA, SASK., CAN.
WIRE CHIEF AND TOLL TEST DESK. REGINA.
TOLL & RURAL LINE BOARD AND CHIEF OPERATORS DESK. REGINA.

to automatic; rural to pay station; rural to rural; rural to toll; toll to automatic; toll to pay station; toll to rural; toll to toll.

A cord circuit is also installed on the recording position, enabling the recording operator to advance calls to the chief and position operators when necessary.

For calling into the automatic board, service and overflow trunks are multiplied into each position where the cord circuits are designed for calling into the automatic board. The "service trunks" terminate on special connectors on each unit, and the operators secure numbers over these trunks by two movements of the dial.

The "overflow trunks" are for use when the service trunks are busy. These trunks terminate on line switches in the automatic board and the calling of numbers over these trunks requires four movements of the dial. When the service trunks are used, the operator controls the ringing, but in case the overflow trunks are used the ringing is automatic. The board is equipped with "in" and "out" orders wires to handle all traffic and testing conditions.

Several special features have been incorporated in this board to facilitate its operation. Chief among these are:

Supervisors' circuit, to enable the supervisors to assist the regular operators and answer calls requiring a conversation but which do not need the attention of the chief operator.

Local trunk circuit, to enable the toll operators to pass a call to other regular toll operators or to the chief operator.

The instruction circuit enables the chief operator to obtain the attention of all operators at once and transmit orders or bulletins.

Operators' switching circuit, enabling one operator to take care of two positions.

The operator's telephone circuit is designed so that when an operator's set is removed from the position switch, the calls to this position are automatically transferred to another position. When all the sets are removed, the calls are automatically transferred to the night section.

The cord test circuit is to test the cord supervision.

The wire chief's test plug circuits enable the wire chief to make tests on lines from the toll board.

A one position chief operator's desk is installed and equipped with circuits for supervising the toll board and information board. All necessary circuits for monitoring and handling public or toll operator complaints are installed in this desk.

A two-section, four-position information board is installed in the toll room and harmonizes with the toll board. It is equipped to handle information, dead level, dead numbers, observation of traffic over automatic lines, and complaints. This board is arranged so that the complaint trunks can be answered at the wire chief's desk on the second floor. All circuits on this board are key ending, insuring rapid service.

The toll test desk and wire chief's desk are designed as one desk. Two positions are assigned to the local wire chiefs, one for testing and routing trouble men, the other to handle subscribers' complaints and make tests through the switchboard on these complaints. These positions are equipped with test distributers so that tests can be made on any line, by means of test distributers and test connectors. (These test connectors are mounted on each line switch unit in the automatic exchange.) Each position is equipped with Automatic Electric Company's standard test circuit. Rack test plugs are installed so that testing can be done on the front or rear of the main frame. Howler circuits, sounder circuits, dial speed indicator circuits, and a wire chief's test switch, order wires and trunks between the other desks are installed for convenience in handling complaints and traffic. Inspector trunks, hospital trunks and observation trunks are also installed here.

The toll test desk is a combined long distance test switchboard, arranged to handle long distance testing, phantom and simplex work. The board is designed so that the phantom, composite and simplex equipment is wired and grouped so that the apparatus can be placed on any line. The long distance lines are wired and grouped so that the lines can be phantomed, composited and simplexed, and can also be patched by means of cords and plugs at any time. The composite, simplex and Morse circuits, are wired in the switchboard, but the equipment for putting these circuits in operation has not yet been installed.

Insulated Transmitters

In an article entitled "Western Electric Developments in 1913," which appeared on page 148 of the March number was a paragraph reading as follows:

Transmitters.—The use of insulated transmitters is being extended as rapidly as possible, to all types of telephones. Heretofore the metal frame of the transmitters has been used as one of the conductors, while the cord attached to a small binding post in the interior of the transmitter has served as the other. The insulated type is inherently a safer instrument to use, as the danger of shock is eliminated.

This paragraph did not belong to the article, and should not have been included in it. It was inserted by an error in make-up, owing to a deceptive similarity in style of type used. Readers who preserve files of TELEPHONE ENGINEER will please mark out that part of the text.

Dean Electric Company Reorganized

The Garford Manufacturing Company, at Elyria, Ohio, has been organized with capitalization of $500,000 7 per cent cumulative preferred stock and $800,000 common stock. Mr. Garford has brought $150,000 preferred stock at par; $250,000 preferred stock has been issued to the bondholders of the Dean Electric Company, there being outstanding $250,000 of the Dean Electric bonds. This stock takes up the bonds.

Officers of the Garford Manufacturing Company are: A. L. Garford, president; A. G. Bean, vice-president; A. L. Patrick, treasurer, and John Watson, secretary. In addition, John Sherwin, president of the First National Bank of Cleveland; John Brophey, manager of the Cleveland Automatic Machine Company; Attorney H. H. Johnson, of Cleveland, and E. F. Allen, president of the American Lace Manufacturing Company, are directors.

The new company proposes to continue the manufacture of the products heretofore manufactured by the Dean Electric Company, telephone apparatus, auto horns and so on, and in addition proposes to manufacture two other products. It is expected that within a few days the company will be working to capacity and that shortly it will be necessary to make enlargements.

Secured creditors of the Dean Electric Company received notes of the Garford Manufacturing Company equal to the face value of their claims and payable in from one to five years. Unsecured creditors receive notes payable in from one to five years in an amount equal to 75

per cent of the face of their claims. Preferred stockholders of the Dean Electric Company receive common stock of the Garford Manufacturing Company in amount equal to 20 per cent of their present holdings. All of the assets of the Dean Electric Company have been transferred to the Garford Manufacturing Company for the securities above enumerated. Stockholders of the Dean Electric Company receive nothing for holdings of common stock.

Western Electric's Sales 8 Per Cent Over 1912

Sales of the Western Electric Company for the year 1913 were approximately $78,000,000, an increase of some $6,000,000 or over 8 per cent over the 1912 sales of $71,727,329. In 1911 sales amounted to $66,211,975. Business in 1913 was pretty close to the estimate made at the beginning of the year.

As a result of business activity and unusual conditions in the middle West due to floods, orders in the early part of the year ran at a much higher rate than that shown for the full year, but in the later half of the period business fell off very considerably. However, an increase in sales of over 8 per cent is no mean gain for the twelve months.

The company added upwards of 4,000 customers last year, bringing the number to approximately 36,000. The increase in business was quite general with customers of the various classes, sales being made to the Bell companies and telephone concerns outside of the Bell system as well as many thousands of customers for electric light supplies. The increase in business applies to central stations and also contractors, despite the decrease in building during the last year, but there was a slight falling off in the business with railways, a not unnatural development under the circumstances.

The export business of the Western Electric Company in 1913 was the largest in the history of the company, notwithstanding the conditions in Mexico.

To increased efficiency of the company's management, considering the unsatisfactory business conditions prevalent throughout the country during the latter part of last year, must be attributed considerable of the growth in the gross business of the company.

Thompson-Levering Apparatus

The Thompson-Levering Company of Philadelphia has furnished many measuring instruments to the New York Telephone Company, as stated on page 152 of March TELEPHONE ENGINEER, and indeed some of its instruments are standard with such companies. The Thompson-Levering Company wishes it understood, however, that it has not been commissioned to build *all* the special insulation resistance and capacity-testing apparatus for the New York Telephone Company, and has no exclusive arrangement with that company for such apparatus.

"Aero" Car Made by Fairmount

The "Aero" cable car was described and illustrated on page 147 of the March issue of TELEPHONE ENGINEER. The many readers of the article who were interested in this cleverly constructed device will be pleased to know that it is manufactured by the Fairmount Electric and Manufacturing Company, Philadelphia. This company will be glad to furnish any additional information that may be desired in the way of prices, performance, records, etc.

Studying American Methods

Four officials of the Royal Hungarian Post and Telegraph Administration recently spent some time in the United States investigating the methods of carrying on the telephone, telegraph and postal business. These officials, who were commissioned by their government to carry on these investigations, were:

Otto von Fejer, counselor of the Royal Hungarian Post and Telegraph Administration, Budapest.

B. E. De Paskay, plant superintendent, Royal Hungarian Post and Telegraph Administration, Budapest.

Foreign Telephone Officials Studying American Methods.

Eugene Kaiser, vice-director of the Telephone Centre, Budapest.

A. De Tersztyanzky, engineer, Royal Hungarian Post and Telegraph Administration, Budapest.

One of their number, Mr. von Fejer, before sailing, gave the following statement to a representative of the *Western Electric News:*

I have been greatly impressed by the magnitude of the telephone business in the United States. It has been a great surprise to us to discover the extent to which the telephone has been developed as a vital necessity for business and private use in your country. We did not believe it possible that telephone service could be so efficiently managed as we have found in your large cities. The promptness with which operators answer calls and the very small number of errors are remarkable.

W. I. Middleton, electrical engineer of the Simplex Wire & Cable Company, delivered an interesting lecture, illustrated by lantern slides, on the manufacture and testing of insulated wires and cables, at the Franklin Union, Boston, Mass., on February 26. He spoke also of the desirability of uniform specification on insulation and the progress recently made along these lines by the Joint Rubber Insulation Committee. He pointed to the marked advance that manufacturers have already made in their testing departments, and spoke of the new voltmeter that his own company has developed for measuring peak voltages.

The Norway King's Council has decided to bring before the Storthing a bill appropriating $262,640 for a new central telephone station in Christiania city and for transforming the present system to an automatic one. All correspondence should be addressed to Kristiania Telefonanlog, Toldbodgt 30 Christiania, Norway.

The Nungesser Carbon and Battery Company, Cleveland, Ohio, has ready for distribution its catalog No. 5, entitled "Brush Grades," giving data and information on various grades of carbon, graphite and composition brushes, which will be sent to anyone interested.

Jamestown Company Gets Wireless Time Signals

The Home Telephone Company of Jamestown, N. Y. (John H. Wright's Company), has made arrangements to receive the time of day from the government station at Arlington, Va., by wireless telegraph. The local company has the local station completed and the citizens of Jamestown can set their watches by Washington time sent to the city by wireless.

The system by which the time is given out is a novel one. At five minutes of twelve o'clock each day the message of time is flashed from the sending station at Arlington all over the country. Every minute after that until noon, is flashed out and received by the receiving stations.

The station at Jamestown will be among the first stations of the country and Jamestown will have the distinction of being one of the first cities of the nation to get its time by wireless. The receiving station equipment is a very complicated mechanism and is being installed by Chief Electrician Rollie Burdic and his assistant R. H. Ingalsbe.

The methods of calling the attention of the public to the signal announcing noon, differ throughout the country. It is probable that the company will put in an arrangement consisting of a red light and a buzzer which will attract attention.

Tri-State Employes Get Together

The first get-together and boost meeting of the Tri-State Telephone Company was held in St. Paul, Minn., February 27 and 28. There were no "bosses" at the session at Fargo hall, Merriam Park, and the employes were free to talk about the company, the managers, the service and any kindred subjects they cared to bring up.

Most of the discussions were devoted to ways and means to increase efficiency and some interesting talks by wire chiefs, plant chiefs and foremen of construction crews were made.

Approximately 300 local and district managers and other employes of the company in Minnesota, Wisconsin and the Dakotas attended the meetings. More than 1,600 towns and cities and several thousand miles of toll lines are represented.

The "bosses" had their innings Thursday night, and in addition to giving booster talks and good advice, told the employes the best way to increase efficiency. Speeches were made by Mr. Williams, R. L. Berry, general superintendent, and Oce Curtis, manager Minneapolis branch.

Phone Rivalry Barred in State

Springfield, Ill., March 3.—Declaring itself against the establishment of more than one telephone system in any city, the State Utilities Commission today announced the most important decision made since its organization. The announcement was made following a hearing in the case of the Macon County Telephone Company against the Bethany Mutual Telephone Company.

Before giving out the formal decision, members of the commission told the attorneys in the case that they would have to show that the establishment of a new telephone system would benefit the community before a permit would be issued for its operation.

The Macon County Company wanted an injunction to prevent the Bethany Company from establishing an exchange at Bethany.

The Bethany Company finally agreed to a strictly mutual business. It can serve only its members and can not do a public business.

Central Union Organization

Announcement was made in Chicago by the three receivers for the Central Union Telephone Company that an organization had been perfected for conducting the business under the receivership. John Uprichard of Chicago was appointed auditor and C. L. McNaughton of Chicago was named treasurer. J. W. Stickney of Indianapolis was named general manager for Indiana, a position he held before the receivership. Both Mr. Uprichard and Mr. McNaughton are known in Indianapolis, having been connected with the company when it had its general headquarters here.

Minimum Wage Question in Arkansas

That he will ask the next legislature to pass a minimum wage law applicable to telephone operators, setting the minimum wage at $7 a week, is the statement of J. C. Clary, state commissioner of labor. He says the minimum wage paid the girls at present is $17.50 a month and the girls can not live on that.

"The lowest salaries paid telephone operators in the state is $17.50, and the maximum is about $27.50," said Commissioner Clary.

Mississippi Settles for $50,000

Settlement of Mississippi's merger suit against the American Telephone and Telegraph Company, the Cumberland Telephone and Telegraph Company and the Western Union on the basis of dissolution in the state, and the payment of a $50,000 fine was authorized in a concurrent resolution approved by the state senate.

A telegram received from Attorney-General Ross Collins, who went to New York city to confer with the officials of the wire companies, said the companies had agreed to the settlement.

Marconi Predicts Transoceanic Telephone

William Marconi delivered a lecture in the ancient Circus of Augustus, Rome, Italy, before King Victor Emmanuel and Queen Helena, all the notabilities in Rome and a great throng of the public generally. Mr. Marconis' theme was the progress of radiography. He predicted the early success of radio-telephony, declaring that the human voice could be projected across the ocean by this method more quickly than a message could be sent by cable.

Louisville Gets Party Lines at Last

The Home Telephone Company of Louisville, Ky., is now at liberty to install party lines at $2 per line per month, the ordinance and contract removing the restriction relative to party lines having been signed by Mayor Buschemeyer and Philip S. Pogue, general manager of the Home Company. Immediately after the signatures had been affixed a check for $5,000 was deposited with the city treasurer, this being a part of the agreement.

The Switzerland Federal Budget for 1914 prescribes an expenditure of 9,225,000 fr. for the establishment of new telegraph lines, interurban and international telephone lines, telegraph and telephone cables, etc.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

Hiram D. Currier is the Kellogg Switchboard & Supply Company's new chief engineer. He was born in Cedar Rapids, Iowa, April 15, 1880. In 1887 his parents moved to Chicago and he entered the public schools and finished in 1894. His high school was finished at Culver Military Academy. On December 23, 1897, he went to work for the Chicago Telephone Company in the supply department. During this year the changes from magneto to common battery practice came about and great opportunity was offered him to familiarize himself with the new lines of apparatus. It was but one step from the supply department to the engineering department. From 1898 until 1901 he had the advantage of associating with Arthur Vaughn Abbott, chief engineer of the Chicago Telephone Company at that time, and J. J. O'Connel, his assistant. Upon advice from Mr. Abbott and with his help, Mr. Currier completed a course in telephony, including considerations of transmission and traffic. He had the benefit of the engineering work on all of the first twelve common battery exchanges installed in Chicago. In 1901, desiring to obtain experience in outside construction work, Mr. Currier went to Baltimore, Md., and there worked in underground and aerial construction with the Maryland Telephone and Telegraph Company. In 1902 he went with the Century Telephone Construction Company and completed a study on transmission for it. In 1903 he went with the Western Electric Company in the installing department and after a year at this work took up engineering inspection in the factory and in 1905 took charge of the circuit laboratory in Chicago. During this time he developed the electrical constants on enamel wire as applied to the windings of telephone apparatus. These constants today form the tables upon which all the electrical specifications for winding are based. The year 1906 found Mr. Currier in the patent department of the Western Electric Company writing technical specifications on semi-automatic and full automatic exchange systems. This work necessitated consideration of the traffic possibilities of semi-automatic and full automatic plants as applied to single and multi-office districts. During all these years Mr. Currier had conducted studies on transmission and telephonic possibilities as applied to other fields than commercial telephony and was called into consultation by the Chicago, Burlington & Quincy Railroad as to the feasibility of dispatching trains by telephone. He developed the first train dispatching circuit wherein the dispatcher was able to converse with all the stations on the line at one time. This circuit was installed between Galesburg and Savanna, Illinois. Certain modifications of Mr. Currier's original installation have been made and applied universally over the United States, but the fundamental practice there inaugurated, such as the use of a push button in the transmitter circuit which was to be operated when talking and released when listening, are still standard. In 1907 he was retained as engineer of the Duplex Metals Company of New York. As a result of his endeavors the Great Northern Railroad Company purchased ten thousand miles of wire from that company and Mr. Currier supervised the installation of telephone train dispatching over the entire system. The telephone business held too many attractions for Mr. Currier to stay with the Duplex Metals Company and consequently he went back with the Western Electric Company and took charge of the circuit laboratory in New York, after which he became associated with the sales department of the same company in Chicago. In September, 1912, Mr. Currier went with the Kellogg Switchboard and Supply Company and took charge of the laboratory and development engineering and has been with that company ever since. During the last seventeen years he has contributed to the art of telephony several patents dealing with the various functions of central office equipment. He has grown up with the industry and is never happier than when working for its advancement.

Eugene A. Reinke, chief engineer of the Stromberg-Carlson Manufacturing Company, Rochester, N. Y., has been chosen as sales manager to succeed H. C. Slemin. Mr. Reinke has spent practically all his life in the telephone industry and has been associated with the Stromberg-Carlson Compny since 1901, at which time he entered the drafting and engineering service. In 1905 he acquired the position of sales engineer, which office he will still retain.

Charles E. Moseley, for many years treasurer of the Chicago Telephone Company, resigned that position at a recent meeting of the executives. Mr. Moseley will retire from active business interests and will be succeeded by Alonzo Burt, first vice-president. H. F. Hill, formerly general manager, was chosen second vice-president and W. R. Abbott was selected as general manager.

George Westinghouse, inventor and pioneer in electrical development, died of heart disease March 12, 1914. During his career he gave to the world a number of valuable inventions and improvements, created new industries, advanced mechanical and electrical arts, and improved in many ways the conditions of modern life. Born at Central Bridge, N. Y., October 6, 1846, Mr. Westinghouse was one of five sons. During his early years his inventions were remarkable, and in 1869 he patented the famous Westinghouse air brake, which was the foundation of his fortune. He was president of a large number of corporations, having an aggregate capital of approximately $100,000,000, the largest of which are the Westinghouse Air Brake Company, the Westinghouse Machine Company and the Union Switch and Signal Company. Mr. Westinghouse was married August 8, 1867, to Marguerite Walker, who with one son, George Westinghouse, Jr., survives him.

W. W. Hiller, who for two and one-half years has been on the staff of Vice-President Burt of the central group of Bell Telephone companies at Chicago, has returned to Milwaukee to take up the duties of chief commercial agent for the Wisconsin Telephone Company.

Guy Pope, for six years superintendent and wire chief of the Home Telephone Company at Findlay, Ohio, has resigned to accept a similar position with the telephone company at Oil City, Pa.

James A. Knight, plant manager of the Consolidated Telephone Company at Fairmont, W. Va., was badly hurt by falling from a street car at Meadow Brook, severely crushing his head.

D. Alexander of Waco, Texas, has succeeded George Dodson as local manager for the Brazos Valley Telephone Company and is now in charge of the Mart office.

John F. Greenwalt, who has been at the head of the department of public relations of the Mountain States Telephone Company at Helena, Mont., has been transferred to Salt Lake, Utah, where he will take charge of the office there in the same capacity.

E. A. Reed, who has served as general manager of the Cleveland Telephone Company and the Central Union Telephone Company of Ohio, resigned as general manager of the Cleveland company and hereafter will give his entire time to the Central Union Company.

F. L. Smiley of the Wisconsin Telephone Company, in charge of the Stoughton exchange, succeeds W. N. Cash as manager of the Beloit exchange.

C. Lyman Meixel, who died March 12 at the York Hospital, was the chief accountant of the Bell Telephone Company in Philadelphia, having been connected with that company for many years. He had been in the hospital at York for some time suffering with a nervous breakdown from overwork. He was 32 years old.

P. E. Jacquet, until recently employed in the Los Angeles

district office of the Southern California Edison Company, has accepted a position with the Pacific Telephone & Telegraph Company at San Francisco.

W. N. Cash, manager of the Beloit exchange of the Wisconsin Telephone Company, has been promoted to district manager with headquarters at Janesville, his territory covering the counties of Rock, Lafayette and Grant. His promotion takes effect April 1.

L. S. Cook, manager of the Bell Telephone Company at Ida Grove, Iowa, has been promoted to the management of the company's exchange at Audubon.

G. H. Morgan, manager of the Melbourne, Australia, telephone exchange, and S. L. Monaghan, assistant manager of the Sydney, Australia, exchange, will visit the United States to study the latest developments in telegraphy and telephony.

C. P. Bradford, local manager of the Bell Telephone Company at Akron, Ohio, has been recently made commercial manager of the Akron district. This gives him general supervision of all the Bell exchanges in northeastern Ohio, except Cleveland. He still retains the local management of the Akron offices.

W. S. Cozad, general traffic superintendent of the Mountain States Telephone & Telegraph Company, with headquarters in Denver, has been in Salt Lake City going over the company's traffic conditions in that state.

After a week's illness with pneumonia Clarence B. Wriggins, assistant manager for the Bell Telephone Company in the Camden district, Pennsylvania, died March 18 at his home, 703 Cooper street. Mr. Wriggins, who was 30 years old, was widely known throughout the city.

C. R. Siegel, division traffic superintendent of the Mountain States Telephone & Telegraph Company, with headquarters at Salt Lake City, has resigned his position and has gone to San Francisco in an effort to improve his health, which has been failing for the past several months.

Allard Smith, recently elected general manager of the Cleveland Telephone Company, has been in the telephone business since 1898 and has held important positions with the Chicago telephone Company. One of his achievements was the building of the telephone subway from Chicago to Racine, Wis., forty-five miles. This was one of the first telephone subways of any great length.

Bert H. Peck has assumed the position of city telephone supervisor in charge of the telephone bureau of the city of Chicago. This bureau was created by the telephone rate ordinance passed by the city council on May 26, 1913, and is vested with the duties of investigating reasonable complaints of telephone service in the city, the enforcement of laws and ordinances relating to telephone service, the analysis of the rules and regulations of the various telephone operating companies in the city and the collecting and compiling of statistical information regarding telephone service in this and other cities. Previous to obtaining this position Mr. Peck was connected with D. C. and Wm. B. Jackson in the capacity of electrical engineer.

NEWS FROM THE FIELD.

CALIFORNIA.

The Pacific Telephone and Telegraph Company has completed the installation of a hotel private exchange branch for the new Hotel Sutter at Stockton. The exchange is equipped with three trunk lines and 127 stations. It was installed at a cost of $1,400.

Charles Loraine et al. of Green Valley have been granted permission by the state railroad commission to construct a rural telephone line from Green Valley to the Sacramento county boundary line.

The Pacific Telephone & Telegraph Company has been granted a franchise in Venice.

The Pacific Telephone & Telegraph Company will erect a three-story telephone building at Fruitvale.

The Home Telephone & Telegraph Company is making extensive preparations for enlarging its service in the southeastern part of Los Angeles.

CANADA.

The North Mutual Rural Telephone Company has been organized at Marmora, Ont., with twenty-two shareholders and it is expected about ten miles of line will be put in during the present summer. Charles Jones is the secretary-treasurer.

The Bell Telephone Company of Canada declared regular quarterly dividend of 2 per cent for the quarter ending March 31, payable April 15 to shareholders of record March 25.

The Warman Rural Telephone Company has been incorporated with head office at Warman, Sask.

The Mornington & Wellesley Telephone Company, Ltd., has been incorporated with $12,000 capital, with office at Millbank.

The Home Independent Telephone Company will buy out the lines of the Oxbridge and Scott Telephone Company at Oxbridge, Ont.

The Simpson Rural Telephone Company contemplates the erection of a telephone exchange at Simpson, to cost $10,000.

The South Kisbey Rural Telephone Company has been authorized to spend $6,500 in construction work.

COLORADO.

A revocable permit to the use of the streets and alleys of the city of Greeley has been granted the Mountain States Telephone & Telegraph Company by the city council upon the payment of a monthly license fee of $100.

GEORGIA.

The American Telegraph & Telephone Company and the Southern Bell were pretty badly crippled by the recent storm. The freeze-up seemed to have done the most damage in and within a radius of fifty miles of Savannah.

Consolidated Telephone & Telegraph Company, Thomasville, was incorporated with capital stock of $250,000.

The Southern Bell Telephone Company in Savannah is arranging to begin work immediately on the building ocupied by Youmans & Demmond, which will be remodeled and used as an annex to the offices, which have grown too small.

The properties of the Cotton Belt Telephone & Telegraph Company, one of the largest independent telephone systems in the city, was sold at public sale at Cuthbert and was purchased by bondholders for $49,000. The system owns exchanges at Cuthbert, Shellman, Fort Gaines, Edison, Carnegie and other points; in addition numerous toll and long distance lines. The new management purposes to further improve the property and extend the service and system.

ILLINOIS.

Permanent organization of the Mutual Telephone Companies of Clay, Richland, Wabash, Edwards, Wayne, Hamilton, White and Gallatin counties was perfected March 7 at a district convention. G. R. Saxe of Edwards county was elected president and J. C. Whetcroft secretary-treasurer.

Without interruption to service, more than 7,000 telephones were "cut over" to the Chicago Telephone Company's new Stewart exchange, 7557 Eggleston avenue, Chicago, at midnight, March 14. The new exchange is one of the finest telephone offices in Chicago. The building is fireproof throughout, built of reinforced concrete. It consists of three stories and basement and represents an investment of $80,000.

The Rock River Telephone Company has dropped the toll system in Ogle county and patrons now have the county service free; but the rural phones still keep the same price.

INDIANA.

The public service commission March 2 authorized the Otterbein Telephone Company to borrow $6,000 to pay an indebtedness.

Notice has been filed of the dissolution of the Northern Indiana Telephone Company of Union Mills.

The Eckerty, Branchville & Cannelton Telephone Company was authorized to buy the plant of the Citizens Telephone Company at Tell City for $350.

IOWA.

Work has been started by the Iowa Telephone Company with a view to removing all overhead telephone wires in the downtown district of Muscatine. This will entail an expense, according to company officials, of some $40,000 to $45,000, and possibly as much as three years' time.

At a recent meeting of the stockholders of the Iowa Falls, Ellis and Buckeye Mutual Telephone Company the following were elected as officers: H. J. Ellis, president; A. Armstrong, vice-president; R. F. Skiff, secretary and treasurer. The directors elected were: I. C. Bullis, L. E. Thorp and R. S. Hillhouse.

The Oakville telephone exchange, owned the past several years by T. A. Lenick, was sold recently to a party from Quincy, Ill.

The Bidwell Mutual Telephone Company held its annual meeting on March 11. Officers elected for the ensuing year follow: President, Gust Seaburg; vice-president, Selmon Lewis; secretary and treasurer, Le Roy Gates; directors, C. R. Chisman, Alfred Gustafson and John Locke.

The telephone exchange at Montrose was destroyed by fire March 18.

KANSAS.

Salina was almost cut off from the outside world as the result of miles of telephone wires being torn down by the recent severe storm. D. A. Van Trine, general manager of the Salina Telephone Company, totals the loss at $25,000.